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OCCUPATIONAL DISEASES AND LEGISLATIVE REMEDIES.

JOHN B. ANDREWS,

Secretary American Association for Labor Legislation, New York City.

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A remarkable development of popular interest in the study of occupational diseases has come about during the past three years.

The First National Conference on Industrial Diseases, in June, 1910, called popular attention to this subject as a new problem. The question then most frequently asked was "*What are occupational diseases?*"

Of course there were common trade maladies then familiar to most physicians and to those engaged in the respective employments. Such popular terms as "lead colic," "miners' asthma," "hatters' shakes," "potters' rot," "boiler makers' deafness," "brass workers' chills," and the compressed-air workers' "bends," are merely suggestive. But we now know that practically every calling contributes its own special malady to the long list of work diseases.

The "Memorial," prepared by a committee of that first conference in 1910, laid a foundation for national investigation, and fifteen states have already passed laws providing for systematic reporting of occupational diseases by physicians. The work of the one state commission led to the enactment of the Illinois law requiring monthly medical examination of the workers in several industries where poisonous substances are used. Similar laws have been secured this year in Missouri, Ohio and Pennsylvania. Moreover, the United States Congress finally passed, in April, 1912, the anti-phosphorus match law which abolishes one disease, the match workers' "phossy jaw." Another bill, now before Congress, is designed to replace the present law providing inadequate compensation for accidental injuries to certain employees of the Federal government, and to extend the compensation principle to embrace also the victims of occupational diseases.

Medical inspection of factories, too, has come to be recognized as important, and Illinois, Massachusetts and New York have developed a state service for such systematic medical inspection of work places.

The Second National Conference on Industrial Diseases, in June, 1912, led to the public discussion of industrial hygiene by physicians, physiologists, factory inspectors, manufacturers, efficiency engineers, trade unionists, sociologists and lawyers. Through the medium of a joint session of the Association for Labor Legislation and the American Medical Association a valuable symposium on industrial diseases was prepared and published, together with a critical bibliography of fifty printed pages. In the latter undertaking the coöperation of the Library of Congress and the federal Bureau of Labor was secured.

The Medical Association, the Chemical Society, the Association for Labor Legislation and the Society for the Conservation of Vision are among the private organizations that have appointed committees to undertake special investigations. Three Federal bureaus are now studying the question in their own respective fields, and several state commissions, bureaus of factory inspection and boards of health are at work upon the problem.

Nature of the Problem.

The first occupational diseases to receive special attention in this country are naturally those which are most easily recognized and which offer reasonable hope of their elimination. A few typical illustrations very briefly stated will be sufficient to indicate this fact.

Phosphorus poisoning, which occurs principally in the match industry, is so clearly defined in character, so loathsome in nature, and so totally unnecessary on account of inexpensive and harmless substitutes, that absolute prohibition was practicable. Even though it was necessary in this instance to use for the first time for such a purpose the taxing power of the Federal government, the public, when finally informed concerning the horrors of "phossy jaw," demanded that it be wiped off the list of diseases.

Lead poisoning is the most prevalent of all occupational poisonings today and Dr. Alice Hamilton is doing excellent work on that subject.

Compressed air illness, with the increasing amount of caisson work in the building of bridges, tunnels, subways and skyscrapers, has made familiar the trade disease commonly called "the bends." It would be difficult to conceive of a disease more clearly occupational in origin, and it seems scarcely possible that we will ever have at hand a remedy more strikingly scientific in form. In fact, the adoption of a regulation as simple as the multiplication table, if rigidly enforced, is sufficient to eliminate practically all danger of "the bends."

Closely following these prominent illustrations will, of course, be added the occupational maladies caused by the anthrax bacillus, and by a long list of industrial poisons, including arsenic, brass, mercury, and wood alcohol. Then, when the occupational skin diseases and eye diseases have been studied, we may expect that more attention will be given to trade diseases of the nervous system, and so on until the field is covered.

Because more easily recognized, the striking manifestations of these diseases are first to receive popular attention. But these spectacular effects of occupational disease are trivial compared with the gradual lowering of vitality caused by the daily breathing of impure air and by continual overstrain. The public should know that occupational diseases referred to in such popular terms as "phossy jaw," "painters' colic" and "the bends," scarcely begin to indicate the disastrous effects of unhealthful conditions of employment.

The principal health risks in industry, as far as we now know them, may be conveniently classified according to their nature as follows:

(1) Specific industrial dusts, fumes, gases, vapors and acids (poisonous and non-poisonous);

(2) Harmful bacteria and micro-organisms;

(3) Compressed or rarefied atmospheres;

(4) Improper lighting;

(5) Extremes of temperature;

(6) Excessive strain.

In what industries are these disease hazards most prevalent? How many workers are affected by them? How many die? Are conditions improving or growing worse? Is occupational disease necessary to our civilization or can it be completely abolished? On all of these questions our information, until recently, has been almost *nil*.

At present we have but few real records. The whole problem of education, factory sanitation and legislation upon this topic is halted, and workers unnumbered are smitten with trade diseases yearly, all for the want of a little fundamental information.

Extent of the Problem.

The extent of the occupational disease problem is scarcely yet appreciated in any quarter.

If we consider merely those diseases due to industrial poisons, we find already prepared a carefully analyzed list of fifty-five, one of which alone (lead) is in daily use in more than 150 trades.

The first state medical inspection of factories in Illinois resulted in the removal from a single establishment of sixty workmen who had become "leaded."

The medical director for the Pennsylvania East River Tunnels, in 1909, reported 3,692 cases of compressed air illness, twenty of them fatal.

The Ohio *Accident* Commission, after careful study, declared that 75 per cent. of industrial injuries reported to it by trade unions should have been classified as occupational diseases.

Careful American authorities count our industrially employed in the United States as 33,000,000, and estimate that, from sickness alone, our mere money loss each year is nearly three quarters of a billion dollars. These experts further declare, on the basis of German experience—"we have no corresponding data for this country"—that one fourth of this annual economic loss (approximately $200,000,000) can be prevented, if we insist.

Prevention of Occupational Diseases.

The prevention of occupational diseases is too great an undertaking to be left entirely to individual action. It cannot be left to the worker, who, even when not ignorant of the danger, is driven by necessity to his task. It cannot be entrusted to the employer whose principal business after all, under competitive conditions, is to secure profits. It cannot be left to medical treatment alone, for prevention and not after care is the remedy. Not only on account of the magnitude of the problem, but also because of its nature, *the prevention of occupational diseases is properly a function of government.*

Every person in the community is concerned in the conservation of the health, vitality, energy, and industrial efficiency of wage earners. All agencies in society should coöperate in preventing unnecessary suffering and death among the producing classes. The protection of the health of the industrial worker is not an individual question. It is a social question demanding social regulation.

Governmental action, however, in promoting industrial hygiene does not mean that private or voluntary efforts of the workmen, or of their employers, or of their physicians, shall be in any way minimized. On the contrary such voluntary efforts will be vastly encouraged.

It must be obvious to any thoughtful person that, in preventing unnecessary occupational diseases, we must have investigation, education and administration. These three requisites can in a democracy best be secured through legislation. It is only through the uniformity of regulation which legal enactments alone can secure, that the more progressive and humane employers can themselves be protected from less scrupulous competitors who would otherwise often fail to provide expensive safeguards. And it is only through compulsory regulations that the health of the employees of these unscrupulous competitors can be protected.

Legislative Remedies.

The final legislative remedies for the prevention of occupational diseases are of three classes. First the method of prohibition, second the method of regulation, and third the method of compensation or insurance.

The method of prohibition may be applied in two ways. It may be used to exclude from hazardous employments those most susceptible to the dangers, as is done in a few states, in a long list of occupations from which young people or women are barred. Medical examination of applicants for jobs in the lead trades and in compressed air work is a more recent extension of this idea to protect adult men. Secondly, the method of prohibition may be used to outlaw dangerous conditions or substances as already illustrated by the poisonous match legislation.

The method of regulation, in the prevention of occupational diseases as in other social problems, is based on the principle of toleration within limits. The majority of the people may believe that certain harmful conditions are so necessary a part of our industrial life that their prohibition is at present undesirable or, ar least, impractical. In dealing with the social evil the adoption of this principle leads to segregation. In dealing with occupational diseases it leads in the work *places* to the installation of exhaust fans, wet processes, vacuum cleaning, separate wash rooms and eating rooms; and for the work *people* to the limitation of working hours.

The method of insurance or compensation is based on the principle that those individual misfortunes which cannot be prevented, either by prohibition or regulation, can best be borne by the community.

The expense of broken machines is borne by the industry, which passes the burden on to society. In recent years we have come to insist that so also should be borne the financial expense of broken legs and arms. The next step must be the extension of the same principle to include incapacity due to arms paralyzed by lead poisoning or incapacity due to other diseases of occupation.

Conclusion.

At a time when the health of the nation receives thoughtful attention, and sociologists, lawyers and physicians vie with one another in pressing upon Congress the need of legislation, the effects of industries upon health call for thoughtful study.

When we get down to business in the attempt to standardize occupations, we begin to realize how much of the modern labor problem is a health problem. Gradually, and surely, but almost without realizing it, we have passed within the last fifteen years into a new period of American history. The courts are beginning to get a new perspective on life. Century-old precedents based on individualism are trembling in the balance. Here and there a judge shows clearly that he has been studying economics as well as

law. Recent court decisions clearly indicate that protective labor legislation will be sustained as a legitimate exercise of the police power when it is made apparent that conditions justify such interference on the grounds of health.

Only through careful study can we secure accurate information which will finally enable us to establish scientific standards. The establishment of such standards is prerequisite to intelligent legislation, to enlightened court opinions, and to efficient enforcement of the law.

While such researches are under way, we should emphasize at every opportunity the following considerations: (1) all preventable occupational diseases must be prevented; (2) those occupational diseases which we do not yet know how to prevent must be reduced to a minimum; and (3) the victims of occupational disease must be compensated for their injuries by some just system of insurance.

AN INVESTIGATION INTO THE RELATIONSHIP OF THE HOUSE FLY TO DISEASE—THE SPECIAL IMPORTANCE OF THE FLY IN INFANT WELFARE.

DONALD B. ARMSTRONG, M. A., M. S., M. D.,

Superintendent, Bureau of Public Health and Hygiene, Department of Social Welfare, New York Association for Improving the Condition of the Poor.

INTRODUCTION.

Many studies have been made in an effort to ascertain the exact facts bearing upon the importance of the house fly as a transmitter of disease. The popular campaign against the house fly, whether well founded or not, has become in this country during the fly season well-nigh universal. It is an interesting fact that, although we have campaigned against the insect regardless of climate or environmental conditions, nearly all of the responsible and scientifically accurate field *research* into this question has been carried on in the South.

There are two diseases concerning which the evidence against the house fly seems to be decidedly incriminating. These two diseases are typhoid fever and the diarrhœal disease of infancy. In the matter of typhoid fever, Dr. Terry, health officer of Jacksonville, Fla., has greatly reduced the death-rate by cleaning up vacant lots, by screening privies and outside toilets and by other methods directed not only toward the elimination of fly-breeding nuisances, but also toward the destruction of fly-infecting nuisances. The contrast to Jacksonville and other southern communities, which northern cities make by the comparative absence of privies, vacant-lot contamination, etc., makes it likely that this method of transmission of typhoid fever is comparatively rare in these better sanitated communities.

The case against "The Fly that Does not Wipe Its Feet" in the diarrhœal disease accusation is somewhat different. Here again, another southern city, Richmond, Va., under the direction of Doctor Levy, has demonstrated beyond doubt that the fly is of importance, under *southern conditions*, in the transmission of this disease.

THE PROBLEM.

The Bureau of Public Health and Hygiene, working under the endowment of Mrs. Elizabeth Milbank Anderson, was urged to initiate in New York City a widespread campaign against the house fly. It seemed, however, that

there had been determined, for northern communities, scarcely sufficient facts upon which one could justifiably base an extensive and expensive campaign. The question of typhoid had been considered by other investigators. The problem of diarrhœal disease transmission had never been thoroughly studied in any northern community and it was decided that an investigation be made in which all morbidity and mortality would be accounted for, in which special attention would be paid, of course, to the diseases frequently accredited to the fly and in which particular attention would be given to the significance of the fly in diarrhœal disease.

Such a study was instituted by the Bureau during the last summer (1913). The work at the present time is by no means complete nor has the investigation been carried far enough to justify the announcement of scientifically authenticated facts. The first step of the research has been completed, however, and it is upon the results so far that we wish to report.

The Plan.

The general plan of the research, broadly stated, was to select an area in the city presenting as nearly as possible uniform conditions throughout. In this area, two sections, nearby but not adjacent, were to be further selected, one of which was to be allowed to remain in its accustomed state, while upon the other it was the intention to concentrate in an effort to eliminate the house fly and particularly to protect infants from the insect. A careful census was to be made of the population of the two areas according to age groups, a careful record made of the amount of sickness in the two blocks at the beginning of the inspection period and a thorough medical inspection given the two areas weekly for a series of weeks, during which time all cases of morbidity and mortality with facts relating thereto, was to be recorded. Several sections of the city were considered and the district finally selected was in the southwestern part of the Bronx Borough. This is an area inhabited solidly by Italians, characterized by high infant mortality rates and boasting all the equipment necessary for the lively perpetuation and joyful existence of the house fly. The two sections selected for study were comparable in every respect so far as could be discovered. The actual boundaries of the protected district were Park Avenue and Morris Avenue, 150th and 151st Streets.

The Census.

The method of taking the census was the same in both sections. The family was taken as a unit and an envelope prepared for each family on the outside of which were recorded the age and occupation of all actual members of the family and of others living in the same apartment. In this envelope were filed weekly the inspection cards made out each week by the visiting nurses and containing all valuable information as to the type

and duration of any diseases occurring among the individuals in the family. A statistical summary of the census will be found in Tables I and II.

TABLE I.

The Total Number of Families and Individuals in the Two Sections.

Protected Area.		*Outside Families.*	
Families	311	Families	311
Individuals	1,725	Individuals	1,744

TABLE II.

Population by Age Groups.

	Protected Area.	*Outside Families.*
Under 1 year	100	98
Under 2 years	175	160
1 to 5	262	298
5 to 15	296	390
15 to 30	552	423
30 to 50	440	419
Over 50	75	117

The educational work, which was carried on in the protected area during this preliminary census period, was directed solely against the dangers of the house fly in the transmission of disease and particular emphasis was placed upon the supposed importance of the insect in the diarrhœal diseases of children. This limitation in scope is true for all of the educational work done in the section throughout the whole experiment. From time to time *inquiries* were made into the conditions prevailing as regards other important factors in infant welfare, such as milk supply, type of nursing, etc. In these instances, however, advice and recommendations were not given to the mothers and the normal state of affairs so far as possible, was left unaltered.

The actual period of weekly medical inspection lasted for eight weeks, from July 21 until September 13.

Anti-Fly Methods.

The methods adopted to oppose the fly were many. Since the children spent the greater part of their time in the houses, every effort was made to keep the flies out ot the apartments and to make it as unattractive as possible when they did get in. The attempt to starve the insect, supplementing similar work indoors, was carried on outside in addition to methods aimed at the trapping of the disease carrier. It avails little, however, to starve, swat and trap the house fly unless at the same time every effort is made to interfere with its breeding. This was also done during the experiment and will be referred to, together with other methods employed, in the following outline:

1. Educational Campaign.

Each home in the protected section was visited frequently by the local superintendent, by nurses employed by the bureau and a nurse generously donated for the purpose by the Division of Child Hygiene of the Health Department. Very thorough instruction was given the mothers and the effect of this work was supplemented by the distribution at frequent intervals of literature in Italian and English describing and depicting house-fly dangers. A valuable supplement to this educational work was the exhibition at a local moving picture theatre at every run for a week of the film on the house fly, loaned for the purpose by the Fly Fighting Committee of the American Civic Association. Free tickets admitting all but very small children were distributed in the block and of the eight hundred of those given out, nearly seven hundred were taken in at the ticket office.

2. Screening.

Screens were placed in every window and door in the block, about seventeen hundred openings in all. The people were instructed concerning the desirability of keeping the screens closed and of protecting them from injury and destruction. It was found, however, that during the warm weather it was practically impossible to keep the screens either in or closed. Not only were they taken out, but they were torn out, and in some cases destroyed. Owing to failure of this part of the program, it is felt that the screening was a very small factor in the anti-fly work, and that so far as this experiment goes it was of small importance compared with the educational and other efforts in determining the results.

3. Fly Trapping.

With the aid of the local Boy Scout organization, large traps were constructed and placed in the courtways, yards, and stables in or adjacent to the district. These were baited and emptied regularly by Boy Scouts under the direction of the local superintendent. Thousands of flies were caught in this manner, many of which were transferred to the Museum of Natural History, where, through the coöperation of the Department of Public Health, a determination was made of the types of flies caught. It is particularly interesting to note, because of its supposed importance in the transmission of infantile paralysis, that about 1 per cent. of the flies were Stomoxys calcitrans (stable fly), while the others were mostly house flies, with a sprinkling of flesh flies, blue-bottle flies, etc.

At the same time, numbers of living flies were caught in the houses, and with the coöperation of the health department laboratories, were taken to the laboratories and their surface washings plated in the ordinary way for the purpose of making bacteriological counts. Some of these flies were

caught in homes of the protected area and others were captured in the uncleaned houses. Not only was the total number of bacteria counted, but plates were made on the Conradi-Drigalski medium. The results of these experiments are given in Tables III and IV.

TABLE III.

Bacterial Count of Flies.

From Clean Houses.

Specimen No.	*Agar at 37° C.*	*Conradi Plates.*
186	12,000	1,500
32	1,500	2,000
209	3,100	2,000
1	1,000	375
575	600	250
*66	75,000	24,000
*1316	4,200	1,300
Average	13,986	4,489

TABLE IV.

Bacterial Count of Flies.

From Dirty Houses.

Specimen No.	*Agar at 37° C.*	*Conradi Plates.*
893	5,000	2,300
365	2,050,000	600,000
392	1,050	125
*835	4,000,000	900,000
*573	575,000	250,000
*683	4,050	275
Average	1,106,017	292,117

It will be noticed that on both the Agar and Conradi plates the highest counts were found on those flies caught in homes in which there were cases of diarrhœal disease. These figures would have to be repeated many times before a convincing average could be struck, but they are suggestive as far as they go and, indeed, are indicative of what one would expect to find under these conditions. The flies in a filthy section have greater opportunities for bacterial contamination than those in a clean area. This is particularly true of the bacteria which would be likely to have their origin in voided intestinal contents.

4. Fly Swatting, etc.

The nurses distributed to each of the homes fly swatters and a weekly supply of fly paper, generously contributed for the experiment. The moth-

*Diarrhœal disease in the home.

ers were educated to see that the fly paper captured the flies and not the babies, and were encouraged in the use of these materials.

5. Disinfection of Breeding Places.

For the purpose of destroying breeding places, the bureau had sent to all the stables in the district sufficient quantities of iron sulphate to insure the efficient disinfection of the manure throughout the experiment. Through experiments carried on at the Museum of Natural History, it was discovered that this material could be used in stables effectively at the slight cost of nine mills per horse per day. Some of the disinfectant was used regularly in the several outside toilets in the district. It was soon discovered that the stablemen could not be depended upon to use the material effectively or intelligently, and consequently a man was detailed to see that the disinfectant was mixed and applied daily.

6. Clean Streets.

With the assistance of a special inspector assigned to the district by the Department of Street Cleaning, it was possible to maintain the streets in a decent, healthful condition.

7. Clean Tenements.

The Tenement House Department assigned an inspector to the section and greatly aided the bureau in its efforts to maintain cleanliness inside the houses, to encourage the use of garbage cans supplied with lids and to prohibit the throwing of garbage and other refuse out of the windows and into the courtyards. The result of the educational work in this direction was quite remarkable, cleaned-up courtways, new garbage cans, etc., being strikingly in evidence.

8. Clean Courtways, Yards and Stables.

The Sanitary Division of the Health Department was requested to give special attention to the section. By the coöperation of the bureau with the sanitary inspector, it was possible to bring about a general cleaning-up of accumulated refuse in the district.

During the whole experiment the nurses were busy visiting each home weekly and making a careful record of all morbidity and mortality, at the same time recording in special tabulations, sickness and deaths among the infants and children. The results of this work will be presented in tabular form and discussed later on.

Field Results.

As to the actual results of the experiment, it may be well, before presenting the statistics derived from the investigation, to give a few general conclusions based on observations made in the field at the time of the work.

The experiment showed the perfect ease with which it is possible to greatly improve the sanitary condition of a district. It was also evident that with the ordinary enforcement of the sanitary code and the other municipal ordinances as they stand, a reasonable degree of sanitation and decency could be maintained.

The continuous and rigid enforcement of the law, if that were made possible by sufficient appropriations, regarding the accumulation of refuse in vacant lots, garbage collection and disposal, manure removal, etc., would very effectively eliminate fly-breeding nuisances in particular. The enforcement of these laws, together with the other anti-fly efforts in this particular section of the Bronx, most assuredly reduced the number of flies in the district. This was determined by actual comparative counts made in the two sections studied. There were many other evidences of the beneficial effect of the work upon the general sanitary tone of the community. New garbage cans with lids were to be seen in abundance, in one instance the nurses counting thirty-nine new cans in a single large tenement. This is an illustration of the general improvement which took place.

Statistical Results.

In studying the statistical results of the research, reference should be made frequently to the population tables presented on a previous page. We may first consider the question of mortality in the two areas studied. The numbers were few in both places, as was inevitable on account of the small number of people actually included in the experiment. Consequently, mortality figures are of less importance than those for morbidity. They are presented in Table V according to age groups.

TABLE V.

Total Comparative Mortality by Age Groups.

	Protected Area.	*Outside Families.*
Under 1 year	1	2
1 to 5	1	3
5 to 15	0	0
15 to 30	0	1
30 and over	0	0
Total	2	6

It is seen that the ratio which the deaths in the protected area bore to deaths in the unprotected families was 1 to 3. A similar ratio of 2 to 5 in

regard to deaths under five years would be of more significance were the figures larger.

When we come to the consideration of morbidity, we are dealing with larger figures and are given a more reliable basis for legitimate comparison. Our statistics showed that of the cases of sickness of all ages and from all causes there were 110 in the protected area and 165 outside. Before considering these cases according to age groups, percentages and special causes, it may be well first to present a summary of the total morbidity.

TABLE VI.

Summary of Comparative Morbidity.

	Protected Area.	*Outside Families.*
Communicable:		
Transmissible by flies { Diarrhœal disease	20	60
Transmissible by flies { Tuberculosis	2	5
Cerebro-Spinal meningitis	0	1
Measles	6	9
Whooping-cough	9	20
Impetigo	20	12
Chicken-pox	0	3
Typhoid	1	0
Syphilis	4	0
Scabies	0	2
Ophthalmia neonatorum	1	0
Bronchitis	0	2
Tonsilitis	3	4
Pneumonia	2	2
Abscess	4	4
Boils	2	1
Non-Communicable:		
Congenital malformation	1	2
Cancer	1	0
Convulsions	0	1
Hernia	1	1
Rheumatism	2	3
Other	31	33
Total	110	165

The statistics in this table refer to the actual number of separate, reported cases in each district. It will be noticed that non-communicable diseases are almost the same in number, the ratio being 36 to 40. This leaves the great difference in the total figures ascribable to communicable, transmissible affections, the ratio in this group being 74 to 125. Of the diseases about which, it is reasonable to suppose, the fly in this climate frequently acts as a transmitter through surface carriage, the ratio is 22 to 65.

When the figures for total morbidity were studied according to age groups, the distribution was as is indicated in Table VII.

TABLE VII.

Comparative Total Morbidity by Age Groups.

	Protected Area.	*Outside Families.*
Infants	32	30
1 to 5	50	83
5 to 15	7	22
15 to 30	7	9
30 to 50	12	17
Over 50	2	4
Total	110	165

It can be calculated from this table that the ratio of the total morbidity among the children under five, between the protected and unprotected areas, is 82 to 113.

As is indicated by the previous studies, the most striking difference in the two areas is found in the figures for diarrhœal disease. We will, therefore, pay special attention to the figures for this form of morbidity. Special tabulations were made, based on these statistics and the result of this work will be presented in the following tables:

TABLE VIII.

Comparative Diarrhœal Disease by Age Groups.

	Protected Area.	*Outside Families.*
Infants	12	19
1 to 5	8	38
5 to 15	0	2
15 to 30	0	1
30 to 50	0	0
Over 50	0	0
Total	20	60

As would naturally be expected, practically all the cases fall in the age groups under five years. There were twenty such cases in the protected area and fifty-seven outside. The duration of these cases was also recorded and is indicated according to time periods in Table IX.

TABLE IX.

Comparative Diarrhœal Disease Cases by Duration.

	Protected Area.	*Outside Families.*
1 to 5 days	6	0
6 to 10 days	7	20
11 to 15 days	1	22
16 to 20 days	2	4
21 to 25 days	2	6
25 to 30 days	1	2
Over 30 days	1	6

The striking difference in the total number of days of sickness in each area is shown in Table X.

TABLE X.

Comparative Total and Average Duration.

	Protected Area.	*Outside Families.*
Total days of sickness	273	984
Average case duration	13¾	16½

This table also suggests, as do the total figures for morbidity and mortality, a greater severity and protractedness of the cases in the unsanitary section.

Other Factors.

Further than the consideration that all the reduction in diarrhœal disease was not due to fly elimination, there are other criticisms on the findings which will be taken up immediately. Concerning the other factors possibly active in the section in reducing the infant morbidity rates, it must be remembered that in making the original selection of the district an area was taken in which practically no infant-welfare work was being done and in which the conditions were uniform throughout. The section was recommended to us for the experiment by several agencies interested in infant welfare for the reasons just stated. In order to determine, however, what were the circumstances concerning the other factors presumably of importance in infant life, a special investigation, but, as before stated, unaccompanied by educational work, was made each week into some particular problem.

The only active infant-welfare agency in the district was a diet kitchen, and the investigation supported the original supposition that the activity of this diet kitchen was quite uniformly distributed over the two districts, the percentage of families receiving milk from the diet kitchen being the same in each section.

The type of milk used was analyzed and another study was made into the type of feeding employed. The results are given below:

TABLE XI.

Comparative Feeding Methods.

Type.	*Infants in Protected Area.*	*Infants in Outside Families.*
Breast alone	88	85
Bottle alone	14	15
Both breast and bottle	23	3
Eating solids	1	13
	—	—
Total infants	126	116

The only difference in this table of any great importance is the excess in the number of infants among the outside families who were being fed other things than milk. Considering the uniformity of conditions as regards the other factors, however, the difference in this one factor of eating does not seem to be large enough to accredit great importance to feeding methods as a factor in the investigation.

Conclusions.

How much importance is to be given to the rather striking figures presented in the foregoing report bearing on diarrhœal disease among infants? The investigation was hampered by certain unavoidable limitations. In the first place, it was impossible owing to the late date at which the bureau entered upon its activities to start the investigation at the beginning of the fly season. It is recognized by everyone that the time in which to begin an anti-fly crusade is in the early spring. Should the experiment be continued another summer, this difficulty could, of course, be removed. The time of investigation was an exceedingly short one, only eight weeks being given to actual medical inspection. This is a drawback, as is also the small number of cases included in the study. Much greater value could be given to the findings if it were possible to deal with thousands of children rather than hundreds, and hundreds of cases of sickness rather than the small numbers herein considered. It is true, also that owing to the large amount of general sanitary work which was done, it is impossible to accredit the disease reduction strictly to the house-fly elimination. There were fewer flies and there seems to have been less disease, but how much of this was due to general sanitary improvement and how much was the result of fly elimination, it is, unfortunately, impossible to say. Another criticism of importance is the fact that while the two areas were presumably approximately the same in every known particular, the balance between the two groups was not as exact as might be desired. Further than this, while it was perhaps reasonable to suppose that the amount of sickness at the very beginning of the experiment was presumably the same in the two districts, and that the smaller number of cases of diarrhœal disease among the children in the protected area in the first week of actual inspection, compared with the sickness among the children in the other area, was the result of the strenuous educational campaign carried on for the three weeks preceding the first inspection, it is not definitely known how much disease there actually was in the two areas before any work was done. Diarrhœal disease had been fairly uniform throughout the whole area in previous years, and it was supposed that such was the case this year. However, should the work be repeated or continued, it would be wise to obtain as nearly as possible all the facts bearing on the amount of disease in the two groups, before the anti-fly work is begun. The study is incomplete, in these and other

respects, and undoubtedly, on a basis of the present findings, we are not justified in attempting to revolutionize infant hygiene. No such attempt will be made, though the facts should be presented and given what credit they deserve until substantiated or revised by further experimentation.

It is felt that the work herein presented is of importance because of the direction it should give to further investigations along this line in northern cities. It is felt that sufficient reliance may be placed on the work, particularly the practical results in the field, to justify an insistence upon the enforcement of the sanitary code in so far as it reaches fly-breeding nuisances. The statistical results also justify the placing of a greater emphasis upon educational work among the mothers regarding the dangers of the house fly in the lives of the infants. This element should become a more important factor in infant welfare work. Finally, the bureau thoroughly recognizes the limitations of the study this summer and is convinced of the necessity of continuing this experiment on a larger, more comprehensive and complete scale through at least one other fly season, before definite positive conclusions can be reached. At the same time every effort must be made to limit the work strictly to the fly. The anti-fly efforts should be carried on in the home itself, and with the infant and his food. Complicating outside general sanitary influences should be avoided. Under whatever auspices this investigation may be continued, it is felt that on the basis of the experience so far, it would be possible with further experimentation to arrive at definite and accurate conclusions regarding the relationship of the house fly to the transmission of diarrhœal disease. The attempt is not being made to draw conclusions from the work so far. The results are presented simply as a record of work done and progress made. In any community the most delicate social and sanitary index is the welfare of society's potential citizen, and because this is true, every effort should be made to arrive at accurate values in this and other problems of infant welfare.

MIDWIVES IN AMERICA.

CAROLYN CONANT VAN BLARCOM, R. N.,

Secretary, Committee for the Prevention of Blindness, State of New York. Chairman, Committee on Midwives of the National Organization for Public Health Nursing.

"THE SAFE DELIVERY OF WOMEN IN CHILDBIRTH IS A MATTER OF NATIONAL IMPORTANCE."—*Newsholme.*

The problem of the midwife as a factor in American life is one which is being considered with increasing seriousness by those who are interested in the prevention of blindness and in other phases of infant welfare. Although the carelessness of many physicians is equally reprehensible, it is due in great measure to the ignorance and neglect on the part of midwives that many babies become blind from what is commonly known as babies' sore eyes (ophthalmia neonatorum).

So far as it is possible to estimate from reports secured from the secretaries of state departments of health throughout the country, midwives attend about 40 per cent. of all births in America.

The extent of their practice is not definitely known and it certainly varies in different localities, but the following percentages of births, attended by midwives during 1912, as furnished by local health officers, are suggestive:

San Francisco	25.0 per cent.
Omaha	25.0 per cent.
New York	39.2 per cent.
Chicago	45.0 per cent.
Toledo	51.0 per cent.
New Orleans	70.0 per cent.
St. Louis	75.0 per cent.

That this is not altogether an urban problem is indicated by reports from various state departments of health, estimating that during 1912 midwives attended 60 per cent. of the births in Alabama, for example; 40 per cent. in Maryland; 80 per cent. in Mississippi; 35 per cent. in Virginia; 50 per cent. in North Carolina; and 50 per cent. in Wisconsin.

The importance of the midwife problem in this country, however, is not measured by the extent to which she practises; for in Denmark, for example, although midwives attend between 90 and 95 per cent. of all births, in that country there is neither the same high death-rate among infants, nor the relative amount of unnecessary blindness which exist in this country.

The blot on our escutcheon is the fact that we give the safekeeping of nearly one-half of our mothers and babies into the hands of women who are ignorant, careless and dirty because they are neither trained nor supervised.

Investigations of the condition of midwives made in various cities during the past few years—notably in New York, Chicago, Cleveland and Baltimore—all disclose much the same information concerning these women. Although there are in America many competent midwives who have received careful training in European schools, reports from various parts of the country indicate that the majority of those practising here are dirty, ignorant and untrained. The extreme ignorance of some of the more unfit of these women is suggested by the superstitions which they foster; one, for example, will advise the mother to wear a string of bear's teeth to make the child grow strong; another that in cases of tardy labor it is beneficial to throw hot coals on hen feathers and place them under the patient's bed; another that it is flying in the face of Providence to bathe the infant before it is two or three weeks old; while others recommend that such articles as cabbage hearts, bacon rinds, beer, etc., should be included in the baby's dietary. This type of midwife knows nothing of hygiene, asepsis or antisepsis and is often practically responsible for the death and invalidism of mothers as well as the death, blindness and mental and physical impairment of infants. Visits to the homes of these women fill one with dismay, for only too often one finds that a midwife with a large practice is herself a dirty, unkempt person living in a squalid tenement. A deplorably large group is exemplified by the old woman of 80 who declared, "I am too old to clean; too weak to wash; too blind to sew; but, thank God! I can still put my neighbors to bed."

Only too often the American midwife assures her patients that it is natural for babies to have sore eyes, and she prescribes such remedies as milk, lemon juice, lard, raw potatoes, scraped beef, saliva, etc., and when the babies go blind, she piously declares that it is the Divine Will.

However, bad as the midwife is, we are sorry to have to admit that on the whole a patient is often better off in her hands than in the care of many of the physicians who compete with her. Investigations which have been made concerning the etiology of ophthalmia neonatorum and puerperal septicæmia indicate that more of these cases are to be traced to physicians than to midwives.

I cite the results of a single such study as an example. The numbers are too small to furnish conclusive proof, but they are suggestive and quite typical.

Of 108 cases of ophthalmia neonatorum investigated by the New York Committee for the Prevention of Blindness in 1913, it was found that 62 were attended by physicians, 43 by midwives and 3 were emergency cases attended by neighbors; 48 of the 62 physicians used no prophylactic against

ophthalmia at birth, nor did 32 of the 43 midwives. In 11 cases in which injury resulted, 6 infants lost one eye, 2 eyes were scarred, while 3 infants became totally blind. The cases of total blindness all occurred in the practice of physicians, while of the remaining 8, 6 were physicians' cases and 2 were midwives'.

It was also learned that 68, or more than half of these infants were taken to eye clinics upon the advice of a lay person, while among the physicians and midwives, the latter were apt to advise hospital treatment for inflamed eyes, while the physicians gave instructions for home care, leaving the details to the mothers with the above results.

Unhappily the problem as a whole presents other aspects quite as serious and certainly more pathetic than the conditions hinted at above. The utter absence of any provision in some of our isolated rural districts for the care of mothers and babies, by either doctors or midwives, gives rise to situations which are distressing beyond words.

Competent physicians are not apt to settle themselves in such communities as are here referred to and certainly it would seem a pity if they did. Excepting in time of the occasional emergency, much of the skill and scientific training represented by such doctors would be wasted. But the mothers and infants in these places have less recourse to relief agencies than the poor in large cities and are consequently pathetically in need of the services which a trained midwife is able to give.

From one such locality one learns that when a woman goes into labor, the first passing teamster is hailed; or perhaps a member of the family hurries down the road for the nearest tanner or blacksmith, or anyone else who through total ignorance will fearlessly rush in to meet the great emergency. The results of the practice—dismembered infants lying on the floor and badly injured mothers—are too sickening to describe, but they can be imagined by those who know the value of trained work.

Contrasted with this we hear from another similar district of a nurse with obstetrical training who has volunteered her services for visiting work among the mountain poor, and who, during the past few years, has delivered about 400 infants. She has given nursing care to the mothers and babies in her charge and has taught the mothers in even the poorest huts how to take care of their own infants. In one case this nurse had to scour a skillet with ashes to provide herself with something that would serve as a basin from which to bathe both mother and infant. But in spite of this meagre outfit they were both bathed and well cared for. This nurse has even managed to have some of the mothers, whom she has delivered, taken to a nearby town and given much-needed surgical treatment.

In America we safeguard only part of the infant population by generally requiring that a physician shall be of good character, well educated at the outset, spend from two to four years in study, and pass a state board

examination before he is legally qualified to assume the responsibility of attending upon the birth of a child; while a nurse must spend two or three years in hospital training before she is considered competent simply to execute the orders of the physician, and give nursing care to mother and child during that critical period of two or three weeks immediately after birth. But excepting in a few localities, both of these functions—those of doctor and nurse—may be discharged by any untrained, ignorant woman who chooses to style herself a midwife!

So far as we are now able to learn, the United States of America is the only civilized country in the world in which the life and health and future well-being of mothers and infants are not safeguarded so far as possible by statutory requirements for at least the training and licensing of midwives. In most of the European countries the training, licensure and control of midwives are regulated by national law, while in some others—in Germany, for example—there are independent state laws regulating the work of these women. Some countries have gone so far as to provide the poor in isolated communities with the services of midwives at public expense. But apparently in no other land has the whole matter been given so little attention as in America.

In striking contrast to the provisions in other countries we find that in America midwives are allowed by law to practise unrestricted in thirteen states;* while in fourteen† there are no general laws relating in any way to their training, registration or practice.

In the remaining twenty-one states and in the District of Columbia where there are laws relating to midwives, it is required in twelve‡ and in the District of Columbia that they shall pass an examination before receiving from the State a license. In six states§ midwives are restricted to attendance upon normal cases, while in seven states|| the existing state provisions for their regulation are so inadequate as to be practically without effect. In New York and Pennsylvania the legislatures of 1913 enacted laws which will make possible the adoption of satisfactory systems of licensure, registration and control in these states.

The following extracts from some of our laws show how little thought has been given to the midwife as an influence for or against the public weal.

The Medical Practice Act of Maine says: "This Act shall not apply to midwives who lay no claim to the title of physician or doctor"; and the main provision of the law of North Carolina is: "That it shall be unlawful

*Arizona, Arkansas, Florida, Georgia, Idaho, Kentucky, Maine, Mississippi, New Mexico, South Carolina, Tennessee, Vermont, West Virginia.

†Alabama, California, Delaware, Massachusetts, Michigan, Nebraska, New Hampshire, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Virginia.

‡Connecticut, Illinois, Indiana, Louisiana, Maryland, Minnesota, Missouri, New Jersey, Ohio, Utah, Wisconsin, Wyoming.

§Illinois, Maryland, Missouri, New Jersey, Ohio, Wisconsin.

||Colorado, Iowa, Kansas, Montana, Nevada, North Carolina, Washington.

for any midwife or other person who habitually gets drunk, or who is addicted to the excessive use of cocaine or morphine or other opium derivative, to practise midwifery for a fee."

In no state is there state-wide provision for supervision of midwives in their practice. In some states this function is discharged by a few local boards of health, but because of inadequate appropriations for such work the results are not wholly satisfactory.

Supervision is of great importance and may accomplish a great deal if it includes a certain amount of practical instruction and explanation, but inspection which means only the perfunctory checking off of the contents of the midwife's bag is almost useless.

If we are to prevent infant mortality, blindness and other calamities which, in may instances can be prevented by careful and intelligent care, we must provide the means for the adequate training of those women who have the welfare of mothers and babies in their keeping.

Registration, supervision and control are important only as secondary measures, for the foundation upon which all of this work must inevitably rest is thorough preparatory training.

Doctor Newsholme says: "The evidence already available points to the conclusion that infant mortality can be lowered by giving adequate training and help to midwives. This especially applies to the saving of infant life at and soon after birth. It has also to be remembered that the midwife's influence with the mother, whom she has helped in her need, is very great; and it is her advice as to the management and particularly as to the feeding of the infant which is most likely to be followed." *

In only six states and in the District of Columbia is it required that midwives shall be trained. The requirements in the District of Columbia and in Maryland are met by having been in attendance at five cases of birth. In Indiana and Minnesota midwives must either have attended a recognized school or have passed an examination, before being permitted to practise. But midwives cannot secure training in either of these states, since they have no recognized schools. This is true also of the states of New Jersey, Ohio and Wisconsin—in which training in a recognized school is made obligatory, before censure.

So far as we are able to learn, the only school for midwives of undoubted high standards in this country is the Bellevue School, established in 1911 in New York City as a result of the combined efforts of the Trustees of Bellevue Hospital and the Committee for the Prevention of Blindness. The capacity of the Bellevue Training School is fifty pupils, the course at present covering a period of six months, which it is hoped will eventually be lengthened.

* "Infant and Child Mortality," by Dr. Arthur Newsholme, Chief Medical Officer of Local Government Board. Supplement to Board's Annual Report, 1909-10, presented to both Houses of Parliament.

The character of the work done by the small group of graduates from this school is extremely gratifying. Although it is acknowledged that the course given is too short, these midwives have commended themselves to both physicians and social workers because of the good care they give to their patients and because they secure adequate medical assistance for other than normal cases.

During the year of 1912 the New York City Department of Health issued licenses to 1,395 midwives. Since then the department has adopted an ordinance requiring a certificate or diploma from a training school of which it approves, before granting a permit to practise as a midwife.*

As the Bellevue Training School is the only one in New York City registered by the Department of Health as "maintaining a satisfactory standard of preparation," it is quite evident that there is need in this one city at least for more extensive provision for the training of midwives.

In those cities and states where no schools exist, there is of course a greater need of education facilities if preparatory training is to be a requirement for licensure to practise.

Unquestionably the midwife problem in America has been too long ignored. It should be faced and one of two courses followed: midwives should be eliminated or they should be trained, licensed and placed under state control.

Probably the reason why this abuse has remained so long unrecognized and uncorrected is that the employment of midwives has never been a common practice among American women, although it is a widely prevalent custom among almost all other nationalities. With the rapidly increasing stream of immigration to this country the problem of the midwife, formerly of relative insignificance, has steadily grown in importance until it has attained its present formidable dimensions. So long as we continue to have this steady stream of foreigners pouring into our country, bringing with them the customs of their fatherlands, just so long and to an increasing extent will there be women of some sort discharging the function of midwives, this practice being one of their oldest and most deeply rooted traditions.

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*At a meeting of the Board of Health of the Department of Health of the city of New York held in the said city on the 14th day of October, 1913, the following resolution was adopted:

Resolved: That the rules governing the practice of midwifery in the city of New York adopted by the Board of Health November 8, 1907, be, and the same hereby are, amended so as to read as follows, the same to take effect on and after the first day of January 1914:

Rule 3. The applicant must be twenty-one years of age or upwards, of good moral character, and able to read and write. She must be clean and constantly show evidence, in general appearance, of habits of cleanliness.

The applicant must also present a diploma or certificate, showing that she is a graduate of a school for midwives registered by the Board of Health of the city of New York as maintaining a satisfactory standard of preparation, instruction and course of study, but the requirement of a diploma shall not apply to an person who is now, or heretofore has been, authorised to practise midwifery by the said board.

(Signed) EUGENE W. SCHEFFER, *Sec'y.*

The desire of foreign women to employ midwives and the determination of midwives to be employed is so strong that even were midwives legislated out of existence they would still be called in by expectant mothers who, instead of paying the fee as such, would leave the usual sum of $5 or $10 in some place where the midwives would be sure to see it. Or should the midwife desire to evade the law she could always find a physician who, for small consideration, would sign her birth certificates, thus leaving her free to practise without the knowledge of the authorities. The patients themselves turn instinctively to midwives in their hour of need, while among the Italians the husbands of the expectant mothers will seldom permit a physician or "man-midwife" to be employed.

Attempts are being made to eliminate midwives in some localities, and they may be crowned with success. But the figures previously given for the larger part of the country, from both cities and rural districts, show how impossible it would be to wipe out such a large and widely distributed profession from the country as a whole.

Elimination would carry with it the necessity of providing some means for the care of the large number of patients at present in the hands of midwives. The combined efforts of doctors, nurses, maternity hospitals and out-patient departments could not meet the demands made upon them by such a large number of patients over and above those they are now caring for. And more than this, if midwives were eliminated many of the patients now being attended by them would fall into the hands of that class of practising physicians which at present is doing as much or even more actual harm than the midwives themselves.

Nor can the social and economic aspects of the question be lost sight of. The midwife is almost a necessity to many of those whom she attends, offering, as she does, both medical attention and nursing care at a cost which seldom if ever exceeds the doctor's fee for medical attention alone. The midwife acts not only as a visiting nurse, but as general adviser and woman friend at a period which is fraught with much anxiety and terror. She frequently prepares the meals and gives aid in a variety of forms which an attending physician could not and would not attempt to offer.

Remembering the poverty and isolation of many of the midwife's patients and the twofold nature of the latter's offices, one can readily understand the tenacity with which her patients cling to her.

It has been advocated that the extension of maternity hospital accommodation would provide gratuitous hospital care for those patients who now turn to midwives. Assuming that the patients could be educated to this point soon enough after their arrival from foreign shores, it is in many instances inadvisable to remove the mother from her home for what must inevitably be an uncertain length of time. The mother's mere presence

in the home often exerts an influence which cannot be removed with safety to others members of the family.

It would appear that the only course for general adoption toward the solution of this problem in America would be the training, licensure and control of midwives where ever they are practising to any great extent. The number of practising midwives would inevitably decrease as the standard of the profession was raised;* those practising would do better work themselves and would call in competent physicians more frequently than they do now.

A beginning toward this end has been made in New York City by the establishment of the Bellevue School for Midwives, and by the efforts of the New York City Department of Health in controlling its midwife problem. The health department requires specified training before licensure and is exercising more and more rigid supervision of practising midwives in New York City.

For the improvement of the practice of midwives throughout the remainder of the state the Public Health Council, established by an act of the legislature of 1913, is empowered to amend the sanitary code, which code may include provisions regulating the practice of midwifery in New York State, outside of New York City. The Public Health Council already has under consideration measures for midwifery reform.

Resolutions favoring the training, licensure and control of midwives by state authority have been adopted by a number of important medical, philanthropic and nursing organizations.

During the past year several members of the nursing profession have registered as midwives with the New York City Department of Health for the purpose of exerting their influence and lending their aid toward raising the status of the profession of midwifery. Further interest in this subject was evinced by the disciples of Florence Nightingale—an earnest worker for midwifery reform—at the first annual meeting of the National Organization for Public Health Nursing, held in Atlantic City, June, 1913. At this meeting a Committee on Midwives was appointed to consider this subject, to offer suggestions and to take steps toward raising the status of the midwife profession.

In advocating that the status of the midwife profession in America be raised, one cannot but feel that both midwives and members of the lay public should be impressed with the wide difference between a midwife and an obstetrician. The midwife should not vie with the doctor, but rather should be a competent visiting nurse with midwife training, who would

*Somewhat similar measures have recently accomplished much for medicine in this country. Witness the fewer medical schools, fewer and better medical men graduated from the schools, and a general uplift along all medical lines. In the United States during 1913, as compared with 1912, the medical schools were decreased by 14, the students by 1,200, and the graduates in medicine by 500.—Report of the Federal Bureau of Education.

be permitted to conduct only normal deliveries, and be obliged to secure medical attention for her patients upon the appearance of carefully defined symptoms of abnormality or complication.

Accordingly, the greatest value of her services would lie in giving intelligent nursing care to the mother and her infant during the twelve or fourteen days following delivery; advising the mother as to her own hygiene before and after labor and arming her with that most valuable and desirable possession, knowledge as to the care of her own infant.

As for the fear that trained midwives would invade the province of the physician, the reverse of this has proved to be the result of giving better training to midwives in England. And, to the credit of American physicians, be it said that they do not, as a body, advance this objection. Physicians and laymen alike are recognizing the fact that this is not a question of providing a living for doctors. It is entirely a problem of securing better care for mothers and babies.

For the purpose of securing as broad a view as possible of this problem and suggestions for its possible solution in this country, the New York Committee for the Prevention of Blindness, in addition to collecting the laws in the United States, has made a study of the laws relating to midwifery training and control in fourteen European countries and Australia,* and of the curricula of foreign midwife training schools.

As the conditions in England, before the passage of the Midwives Act of 1902, closely paralleled those existing in America today, the secretary of the Committee for the Prevention of Blindness was commissioned to visit England for the purpose of making a detailed study of the working of the Midwives Act. This investigation included (a) a study of the early history of English midwives; (b) legislative history of the Midwives Act of 1902; (c) the organization, powers and duties of the Central Midwives Board appointed under the Act, and its methods of examination, licensure and control of practising midwives; (d) the training of midwives as carried on in hospitals and out-patient departments of hospitals and by physicians and certified midwives in their practice; (e) the administrative methods of local health officers, together with records of the work done by midwives under their supervision, and a study of the practical work done by the midwives themselves; and (f) the general effects of the workings of the Midwives Act.†

Women engaged in this profession in England are required: (1) To take a course in midwifery in a training school sanctioned by the Central Midwives Board, which was appointed by an Act of Parliament in 1902; (2)

*A digest of the foreign laws has been prepared and may be obtained upon application to the New York Committee for the Prevention of Blindness, 130 East 22d Street, New York City.

†A copy of the report upon this study of the working of the Midwives Act of 1902 may be obtained from the New York Committee for the Prevention of Blindness, 130 East 22d St., New York City.

To pass the examination given by the Central Midwives Board, and to present certificates of their good moral character; (3) To be registered and licensed by the board after examination; (4) To conform to the rules and regulations formulated by the board pertaining to the details of their work and equipment so long as they practise.

These regulations are enforced by local supervising authorities, who employ midwife inspectors who devote their entire time to the inspection of these women, their homes, work and equipment, and to enforcing the rules of the Central Midwives Board.

While it is not possible to reduce the value of trained midwifery work in England to any concrete terms, there is significance in the fact that during the nine years, following the enactment of the Midwives Act, the percentage of deaths among infants dropped from 151 per 1,000 during 1901, to 106 per 1,000 in 1910, and the deaths from puerperal sepsis and accidents at childbirth dropped from 4.65 per 1,000 in 1901 to 3.69 per 1,000 in 1909. It cannot be claimed that this decrease of deaths among mothers and infants is due solely to the workings of the Midwives Act, but it is believed by English workers that the better obstetrical work including nursing and medical assistance now being done among the poor in England must be reckoned as one factor in this decline. Midwives in England attend about 50 per cent. of all births.

A modification of this general system would be quite feasible for adoption in this country, since the problem in America today is strongly analogous to the one formerly existing in England, though ours is of greater magnitude and complexity, and it resolves itself into the need of supplying: (1) Facilities for the training of midwives; (2) examination and licensure by the state; (3) supervision and control by local authorities under state control. Complete mastery of the situation requires that all three of these provisions exist.

Concerning training, there seem to be, as previously stated, but one reliable training school for midwives in this country. There is a large number of institutions designated as midwife training schools, but these are virtually nothing more than "diploma mills." Even these are poorly attended since there is little or no incentive for a midwife to enter them in quest of knowledge or training. A training school diploma is not necessary in order to enable her to practise.

If state boards of education were empowered to establish a standard to which all schools for midwives were required to conform, the first important step would be taken toward raising the status of this profession.

The authority to examine and license midwives should be vested with the state departments of education or the state departments of health in those states where it is not possible or feasible to create departments to deal solely with the midwife question. If one of the state departments men-

tioned required a diploma from a school for midwives sanctioned by them before granting a license, those desiring to follow this profession would accordingly be obliged to fit themselves for their work.

Midwives should be required to renew their licenses annually and to take a short post-graduate course every two or three years. Anyone not properly registered and licensed should be prosecuted for performing any of the functions of a midwife habitually or for pay.

The state department should adopt rules and regulations governing the practice of midwives and should stipulate the details of a midwife's equipment.

The control of the midwives, however, and enforcement of these rules, would be most satisfactorily carried on by local health officers. These local health officers should also be vested with power and authority to supervise the midwives themselves, their work, home and equipment, and temporarily suspend them from practice for the sake of preventing the spread of infection.

Thus the three needs—education, state licensure and supervision—would be met, and in time this would inevitably spell the solution of the midwife problem.

It has been stated that at least 40 per cent. of the births in America are attended by this group of practitioners. The question before us is, therefore, not whether or not we shall have midwives in America, but rather whether or no we shall continue to pass by with averted eyes and leave such a large percentage of mothers and new-born infants in the hands of ignorant women incapable of discharging the important functions which they assume.

"It is the lame and the blind who are paying, the working woman with permanently impaired health, and the motherless children!"—*Alice Gregory.*

THE MEANING OF "FAITH CURES" AND OTHER EXTRA-PROFESSIONAL "CURES" IN THE SEARCH FOR MENTAL HEALTH.

WILLIAM A. WHITE, M. D.,

Superintendent, Government Hospital for the Insane, Washington, D. C.

Medical humbugs of one sort or another have always existed, but perhaps they have never flourished to the extent which they do at the present day, in spite of the fact that we are given to flattering ourselves upon our rapid advances in the knowledge of natural phenomena, and in particular our rapid advances in the medical sciences. The phenomena of medical charlatanry, patent medicines, and faith cures are, therefore, of especial importance to us now and, I think, have a particular significance which it is worth while to inquire into. I shall, therefore, endeavor to approach the problem, not with a view to disposing of it by acrid criticism or by casting ridicule upon the theories which are set forth by the exploiters of these various cures, but I shall try to approach it with a view to understanding what the meanings of the phenomena really may be, on the principle that there is a grain of truth in everything and that it is worth while to find out wherein lies the truth in a movement which is so widespread, and which involves the health and happiness of so many people.

I am particularly anxious that we should approach this problem in a judicial and unimpassioned frame of mind, for I am convinced that the phenomena under consideration are of great importance and that they represent a source of considerable suffering and not infrequently of positive danger to a great many people who might be relieved by adequate and rational treatment. I am also convinced that a study of the conditions under which they manifest themselves offer most valuable suggestions in indicating the way we should go in dealing with certain problems of mental hygiene. It would be a pity if phenomena, which offered so much in the way of valuable material for study, had their usefulness destroyed by being approached in any other than a calm spirit of inquiry. In fact appeals to prejudice or to passion are almost sure to aggravate the very difficulty that they are brought forward to cure. The various sects of healers, of one sort or another, that have grown up around the borders of the medical profession have not failed to demonstrate this general law of mankind. They have thrived under attempts to exterminate them because they have been given an opportunity to pose as martyrs and have thus been knit together in a stronger union to oppose a common foe, and have, therefore, like all peoples, who have been able to survive persecution at all, ultimately thrived under it. Let us see if we can understand somewhat of the principles which are involved.

In the first place, we may feel sure that the growth of these various sects

of healers has taken place in response to a demand upon the part of the people. They have come into existence because of a need which a large number of people have, and they are, so to speak, the answer to that need. That need, of course, expressed simply is the need for better health, but if we will confine ourselves more particularly to the class of cases that interest us at this conference, namely the mental cases, it is a need for greater happiness, for greater peace of mind. Beyond that the need need not be more specifically expressed. In this restless civilization of ours it is pretty difficult to find a place where one may feel that he has attained the things which make life worth living and is no longer assailed by cares and worries that destroy all of the conditions upon which peace of mind may be based. The restless multitude, seeking for peace of mind—for happiness, for fulfillment, or whatever you wish to call it—express the need that I spoke of a moment ago, and so along comes a whole host of medical, religious, even political and sociological sects of various sorts which minister to this cry for help. Some people get comfort out of religion; some people get comfort out of associating themselves with various charitable or reform movements; fads of all varieties and in every sphere of life grow up, and among them come these sects of healers who point out to the dissatisfied—the unhappy—that their trouble is due to this or that, that it is dependent upon some physical disorder, perhaps of the kidneys or some other organ of the body, or that it is mental in origin, and, therefore, needs some kind of psychotherapeutic treatment. A certain portion of these unhappy people flock to the standards that are raised by these individuals who claim to know what the matter is with them and how they may be cured. This attitude is perfectly understandable. It is not only not strange that it is so, but it would, indeed, be strange if it were not so. The chronic invalid will almost surely and quite naturally take the advice of a man who says confidently "I can cure you." Who would not? Wouldn't you and I if we had been pronounced hopelessly ill, if we had spent years in fruitlessly seeking health only to see it gradually failing us? Why not at least try?—it can do no harm, and then this same man cured Smith and Jones, and perhaps he may cure me. It surely is worth the trial. This argument is controlling if we have no standards of comparison that we have made our own by which we may judge of the real value of the claims set forth. It must be remembered, too, that many of these practitioners are sincere in their beliefs and really think that they can do what they claim, and we must also not forget that they do succeed in doing what they claim, at least apparently, in a sufficient number of cases to give some warrant for their faith in themselves and for other's faith in them.

If we will look over the history of these cures we will find that almost everything which the imagination may conjure up has been used to cure the ills of human kind and that almost every ill that can be imagined has

been reported cured by such means. People have been cured of most everything under the sun, by little pieces of metal, by bottles of medicine, by salves, by electricity, by holding on to iron rods that led into a tub of bottles and water, by hypnotism, suggestion, and finally by religion, and all these various means of cure have cured ills equally various and have all cured the same sort of ills. Now the first principle that I may lay down from this statement is that whenever we find a certain kind of illness cured by various and divers means, under all sorts of conditions and circumstances, we may feel reasonably certain that nothing in the agent applied has really had anything to do with the recovery of the patient; that the patient not only carried within himself the conditions which made him sick, but he also possessed within himself the powers which rightly used could make him well, and that the most which the remedies offered could possibly have done was to awaken within him these powers and cause him to put them to use. A paralysis which may be cured indifferently, either by a bottle of medicine, the application of a magnet, or a prayer, is certainly not the sort of paralysis which is dependent upon any material disorder of the body that we know of; certainly not the kind of paralysis which requires for its amelioration the bringing into contact with the disordered tissues a remedial agent of some sort; certainly it is quite different from this, and you may easily understand from this example why it is that I say that the patient contains not only the conditions which make his disease possible, but also the power to make himself well, for it is hardly conceivable that such different remedies as liquid medicine, the application to the surface of a magnet, and prayer could have some common quality which was responsible for the result.

It is this class of cases, which I have illustrated by the patient with paralysis, who are appealed to primarily by all sorts of alleged cures, and it is this class of cases that frequently make an apparently good recovery from their symptoms under the treatment that is given; it matters very little what that treatment is, and, therefore, these various cures derive a very great support from producing such results, a support which I think you will see from my presentation thus far is entirely an ill-deserved one, for it makes the claim of having produced a result which is not altogether a just claim, although there is a certain justice in it. Without attempting to explain just exactly how these cures are effected I may say that in such a case of paralysis as I have cited the trouble with the patient is that he thinks he is paralyzed, and when he can be made to think that he is not paralyzed then the paralysis disappears. This disappearance of the paralysis, as a matter of fact, did follow the treatment and was in some way dependent upon that treatment and, therefore, there is a certain justice in saying that the practitioner, whatever his method, really did cure the patient. Herein lies the abiding fallacy of the whole situation and the one particularly to which I desire to direct your attention.

Truth is evasive; perhaps we never can attain to absolute truth with regard to any special problem. Perhaps the best that we can do is to keep striving, and by striving to come always nearer and nearer, though we never quite attain. And so we have to measure the claims of the class of people of whom I am talking against the claims of others with a view to seeing which of the several claimants most nearly approximates the truth. Now it is true that a certain patient with a certain type of paralysis goes to one of these healers, submits to his treatment, and following the treatment the paralysis disappears. That happens over and over again, and the healer says, with some considerable reason, that he is cured of paralysis. Now let us examine this situation and see if we cannot understand it a little better than by resting at such an assertion. Perhaps I can approach what I wish to say best by an illustration. Let us take a walk through a picture gallery and let us pause here in front of a picture—a picture by an old Italian artist. There are a series of them all dealing with the same subject, the subject of St. George and the Dragon—and let us look at this one in particular and see what we shall see. The first things that strike our eye are: a picture of a certain size made up of figures, rather highly colored, upon a background relatively neutral; to the left there is a dragon; to the right a man upon horseback approaches the dragon with a lowered lance, and nearby a blonde-haired, blue-eyed maid sits passively upon a rock; in the background there is the sea with two ships riding on its surface. Now these things are all visible at a glance and all of the things that I have said to you are true. I might go even further; I might tell you, for example, that the color of the horse was brown, and that would be a truth. But what do all these truths mean to you? What do they mean to any one who sees only these truths? They are all extremely superficial. They, none of them, help us in hardly any way to understand the picture at which we are looking. We recognize that there are certain pigments spread on canvas and that they form these several outlines that I have described to you, and that they are formed in certain colors and in certain relations one to another, but these truths, truths though they be, are superficial and have little meaning and certainly practically no helpfulness, for what we are after is some understanding of the picture. Then let us look in the catalogue and we will find that this is one of a series of pictures illustrating the conflict between St. George and the Dragon. Here comes a distinct illumination. Now we really know something about the picture; we feel that we have come to some understanding of the canvas before us. But I wonder how much we really have found out after all. We all know that there is a legend of a fight between a dragon and St. George, but in most of our minds the legend is pretty hazy, and although we know it exists we do not know what it means. So let us turn to our libraries and see if we can find out something about this legend. We very soon discover that the

legend is a widespread one; that it has many variants in different parts of the world; that it undoubtedly has its roots in simpler and earlier legends of more primitive peoples, connected probably with harvest times, and thus we may correlate the story of the picture with the most widespread beliefs over the face of the earth and trace its roots down almost to the very beginnings of things in the mind of primitive man. Now surely we are beginning to understand something of what the picture really means. But even with this added light, why is the horse brown; why not some other color? Why is the hair on the man's head wavy and fine? Why are there all about the dragon skeletons and mangled bodies, and why does the hair upon these heads grow downward in great heavy masses that seem to sink into the ground like the limbs of a tree? Why is one of the ships in the background being wrecked on the mainland and the other sailing out clearly on the surface of the ocean? And so on we might ask many, many questions, and we see that still we are far from an understanding of the picture. If, however, not resting with having associated this legend with many other similar legends throughout the world, if not resting with having shown its roots among primitive peoples, we seek still further, we would find that the conflict between St. George and the Dragon, in its fundamentals, is only one of the innumerable variants of the old, old conflict, as old as mankind, the conflict between good and evil. When we have found its fundamental fact then some of these things in the picture become understandable. St. George represents the spiritual power making for good; the hair upon his head, which is fine and silk like, rises up as if it would have its roots in Heaven. The Dragon represents the power of evil, and the heads of the people who have perished in their conflict with evil have hair which grows downward into the very earth and roots them to the earth earthy. And so forth and so on the whole intricate symbolism of this complex picture leaps into our understanding, because we have finally gone deep enough in our search for truth so that we have gotten at the principles underlying it all.

Now to come back to our problem from this illustration. It is true that certain paralyses disappear after certain kinds of treatment, but if we stop there we are in no better position for understanding the phenomena presented to us than we were when we stood in front of the picture and noted simply the forms and the colors of the figures upon the canvas. We must have a more profound knowledge of human beings before such sequences of events can mean anything. If you will look in one of the rooms of this exhibit you will find a diagram, representing in a simple way the makeup of the human individual. That diagram is in the form of a triangle and the triangle is divided into sections by transverse lines. In the lowest level of this triangle is written the word Physical; above this are other levels which are designated as Chemical or Bio-chemical and Physiological,

and still at the highest part of the triangle and occupying its apex is a level designated as Mental or Psychic. The phenomena of the paralysis which I have been telling you about are phenomena at the psychic level. Without attempting to explain it any further than I have, let me show you how any one who confines himself solely to this level may fall into serious error. Suppose a patient consults an individual because of a certain type of harassing idea. Now it may well be that that harassing idea has its whole origin within this psychic level and that the treatment of one of these healers may result in the disappearance of the idea and the getting well of the individual, that is apparently. Suppose, on the other hand, that another individual with the same kind of an idea seeks one of these healers and the healer applies the same kind of treatment, but the patient does not get well. What may be the trouble? One of the troubles which may exist, and which does exist in a large number of cases, is a disorder at a lower level. This man may have Bright's disease. There may be the poison of a chronic disease of the kidneys circulating in his blood and his mental condition may only be the expression at the mental level of the real disease which lies beneath. How is the man who deals only on the psychological level going to know the possibility of such a thing. He can't, and therein lies the positive danger of these faith cures. While temporizing and trying to cure a person on the psychological level, conditions which are more fundamental are going wrong and perhaps leading the patient towards his grave. You will see here again an illustration of what I mean by the relativity of truth, that while we may only approximate truth we must at least search for it as deeply as we can, and it is only when we are stopped by being able to go no further that we have a right to say that we are at the end of our journey.

Very few of these healers would endeavor to cure any disorder at the physical level by appealing to the mind, because this is too potently ridiculous. A broken bone they would hardly endeavor to heal by suggestion. However, and only recently, I have been reading the claims of a certain school of faith curers who endeavor to do something quite as ridiculous. They suggest how, by certain mental influences, they may stop bleeding. Here is a disorder at the physical level. Suppose a vessel is bleeding; the disorder is not mental; it is not even at the bio-chemical level; it is still lower at the physical level, and the only way to stop the bleeding is by some physical method. It has to be met on its own level and no appeal to the mind will do it, and, whereas, in many instances claims of this sort may do no harm, in a case of this sort it can be readily seen how a patient might suffer serious and permanent damage while somebody was fooling with a means of cure, the application of which was absolutely illogical and absurd. Many other such instances might be cited. For example it might be subjecting the patient to the gravest danger of middle-ear sup-

puration, with possible meningitis and death as a consequence, to temporize by trying to cure an earache by mental means.

It becomes evident, then, from these considerations that the only person who is properly qualified to treat a sick individual is one who knows the problem of disease, not only at one level, but at all levels; who knows not only the length and the breadth, but also the depth of the problem; and who, therefore, has the greatest relative ability to follow truth the furthest. To confide one's health to the keeping of an individual whose whole education has been confined to one level, or whose whole education has been taken up with the exploitation of a single portion of the body or a particular theory of healing, is to court disaster, and, although it may work fairly well sometimes, on the whole it is an extravagant and wasteful business, for, although I have not yet said it, and although time does not permit going into a detailed account of the reasons for it, even the people who get well, as I have suggested, always qualifying the term well by apparently—even the people who get apparently well from the treatment which is given them are really and truly in most instances no better off than they were before. The real disease focus is never reached by these methods and only a superficial change has taken place, which is of but temporary duration; and so these people, exalted to the highest hopes by apparent recovery, are apt shortly afterward to be plunged into a greater despair than ever before by a return of their ailment. This is, of course, due to the fact that these healers not only do not understand the phenomena of the level at which they are working and with which they deal nor the phenomena of other levels. Their failures, which are never recorded, only the so-called "cures" being exploited, would show their serious shortcomings.

Further than this, purely psychological problems may be dealt with superficially or with profound psychological insight. We often hear it said that such patients, as the one with paralysis I have mentioned, are cured by suggestion or by faith. That is true, but again misleading because a superficial truth. It is true that the color of the horse in the picture before referred to is brown, but that does not mean anything until we have found that it is symbolic of the earth and stands for strength and endurance. "Now faith is the substance of things hoped for, the evidence of things not seen," but the faith that is awakened in the patient is not, as generally supposed, faith in the practitioner, but faith in themselves, and while such faith may go a long way it only too often falls short. To utilize such faith to its full, profound psychological knowledge is required, and not such superficial and dangerous empiricisms as confuse sequence with effect. You can see how vastly better qualified is the physician who has such knowledge, and very much more besides, than is the empiricist, no matter how sincere, to undertake therapeutic applications.

The type of reasoning which concludes that, because in a certain person the symptoms of his illness disappeared after the application of a certain remedy; that, therefore, that particular remedy was the cause of their disappearance, is most dangerous, because most logical. The conclusion is one of those pitfalls of the obvious to which we are all liable in proportion to the superficiality of our knowledge. It is the same kind of reasoning that led primitive man to believe that he could make rain by going through certain ceremonies. These ceremonies vary greatly, but for the most part consist of imitating a storm and sprinkling water on the ground. After they have been carefully performed in all details then it rains—sooner or later—and the rain is assumed to be the result of the ceremonial. It is the confusing of sequence with effect and is one of the most prolific sources of error and of groundless superstitions and theories. The rain comes following the ceremonial of the rainmaker, but is the result of natural causes over which he has no control whatever. Many of the reputed "cures" also come about following certain forms of treatment—also as a result of natural causes, over which the individual applying the remedy has no more control than the rainmaker.

It, therefore, follows that no one should be permitted to practise the art of healing except he be grounded in the structure and functions of the human body and the application of all varieties of remedial agents at all levels, and it is the function of the state to see that the people who are accredited by it to practise the art be so equipped.

The whole subject of medical education, the equipment of the individual to practice medicine, is a complex one, and very naturally the claims of medicine as applied to the lower levels—to the physical and the physiological—have received attention long before the claim of medicine to be applied at the psychological level. The psychological level is the last level to come within the ken of the physician because it is the most complex and the most difficult to confront and requires a great dea' of knowledge about the lower levels before it can be approached at all. Therefore, it has remained the stronghold of the charlatans and the faith curists. Even the most elementary instruction is not given today in many of our medical colleges regarding the disorders at the psychological level, and the general result is that these different faith curists prosper, and the physician, knowing deep down within himself that the whole business is nonsense but having no adequate education in such matters so that he can define wherein the nonsense exists, is compelled to defend himself against them by attempting to cast ridicule upon their methods, and if approached for an explanation of what the trouble is he is pretty apt to be so weak in his replies as to help the cause of the opposition more than to hurt it. The cry of the mentally afflicted has brought the inadequate response of the charlatan, and it is because the cry is unintelligent that the answer is inadequate.

In the last few years, however, there has been a noticeable change in the whole matter of medical education. The Carnegie Foundation and the American Medical Association have been making such surveys of the medical colleges as have resulted in their being grouped into various classes according to the excellence of the instruction given. Such a public pointing out of the class to which a medical college belongs has deflected many students from the cheaper colleges, where medical education was at its lowest ebb, and resulted in the closing of these colleges because of lack of income and a resulting lessening in the number of medical students throughout the United States. The situation now is that no person can blindly go to a medical school without knowing just where that medical school stands in degree of the excellence of its educational facilities, and no individual who employs a physician need lack that knowledge. Therefore, from our side, a great step has already been taken in advance in the better equipping of the man who is to practise medicine in the community. Now, on the other hand, it remains for the public themselves to make greater demands upon the physician, and not only maintain the standard which we have reached thus far, but create a still higher one. In the matter of the ills of the mind, physicians today are, on the whole, quite unable to cope with the problems involved. Practically none of the older physicians have ever had courses in their medical training that dealt with mental disorders, and very few of the younger practitioners have ever had anything that remotely resembles anything like an adequate course of instruction. Therefore, the physicians, themselves unable to meet these conditions, are indirectly one of the greatest sources of revenue of the charlatan. The charlatan gets what the physician cannot deal with. It becomes, therefore, the duty of the physician to equip himself to handle these conditions rather than to bewail the fact that his patients go elsewhere, and he will equip himself and he will be able to handle them when the public make an intelligent demand upon him for that class of service.

You will perhaps have noted that I have not undertaken to deal in this paper with distinct frauds. There are many claims by all sorts of persons to cure disease that are plainly and simply fraudulent and require treatment from that standpoint by the machinery of the criminal law. It makes little difference to the patient, however, whether the claims are fraudulent or sincere so long as the result is the same in either case. I have merely tried to point out some of the fallacious methods of reasoning that make it possible for either or both to make a successful appeal. Ignorance is the soil in which all such claims prosper. To spread a greater enlightenment about matters mental is the object of this conference to the end that the needs of the mentally ill may be met by a more intelligent and, therefore, more helpful response than by the methods of the charlatan, the quack, or the enthusiastic and sincere faddist.

THE PREVENTION OF CARRIERS.

WILBUR A. SAWYER, M. D.,

Director of the Hygienic Laboratory of the California State Board of Health.

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The human carrier has been charged with being the principal storehouse and distributing agent of many of our infectious diseases. Chapin* has shown that the enforced isolation of acute cases of contagious diseases, although often effective in small towns and newly invaded communities, is nevertheless of little avail in improving the morbidity statistics of our principal cities. He holds that the inadequacy of isolation is due to the existence of a large number of unrecognized carriers and missed cases.

The beginning of a realization of the importance of human carriers is shown by the efforts we make to detect and control them. These measures, like the present methods of isolation, are producing a minimum of result except under the most favorable circumstances. The responsibility for the disappointing lack of results lies largely in the limitations of those methods of laboratory diagnosis by which carriers are detected, in the lack of sufficient epidemiological investigation of carriers in the field, and in the utter impracticability of effective control of most of the carriers discovered.

In laboratory examinations, one of the principal difficulties in the detection of carriers is the frequency of misleading negative results. It is a well-recognized fact that long-standing chronic carriers are often intermittent in the discharge of the infectious agent. This is well illustrated by the way in which successive cultures from diphtheria carriers give negative results between positive results. Sixty-five out of 364 carriers, discovered during an investigation by the State Hygienic Laboratory at the Southern California State Hospital,† gave positive cultures after they had given from three to eleven successive negative cultures from nose and throat. Although in some instances the reappearance may have been due to reinfection from other carriers, the conditions during the investigation were such that this was probably only exceptionally the case.

The intermissions in the discharge of typhoid bacilli by carriers is well known. A typhoid carrier who came under investigation by the California State Board of Health‡ well illustrates how adequate field investi-

*Chapin, Charles V. The Sources and Modes of Infection, Second Edition, 1912, pp. 136–147, 155–159.

†Henderson, Margaret. Twentieth Biennial Report of the California State Board of Health, 1906–1908, pp. 200–203, and an unpublished fuller report of the investigation.

‡Sawyer, W. A. A Typhoid Carrier on Shipboard, Journal of the American Medical Association, May 4, 1912, Vol. LVIII, pp. 1336–1339.

gation might help in the detection of carriers. This man had been previously suspected, but, as examinations at a city laboratory happened to be made during an intermission, the suspicion was held to be unfounded and the carrier continued to infect his comrades. An epidemiological field investigation made for the state board of health yielded a mass of information indicating indisputably that the man was a carrier, and this evidence was confirmed later by examinations at the State Hygienic Laboratory.

The example just cited illustrates how the effectiveness of our control of carriers is diminished by the common undervaluation of epidemiological field investigations when contrasted with laboratory work. The field workers should be fully as efficient and well trained as those who make the laboratory investigations. The worker in the field can produce evidence with regard to the relative importance of individual carriers by finding out what actual harm they have done, while laboratory tests classify the carriers in large groups according to the nature of the organisms isolated from them. Too often the health official puts great weight on the test of a culture of the diphtheria bacillus for its virulence for guinea-pigs while much more instructive accidental tests of the same organism on human beings remain undiscovered because unlooked for. The study of the typhoid carrier already mentioned presents an example of the value of the facts unearthed by careful investigation in the field. In this case the laboratory proved only that he was intermittently excreting typhoid bacilli which were definitely identified by cultural and serological tests. The field investigation, on the other hand, was able to show that he was an exceedingly dangerous carrier who had already infected twenty-seven men, four of whom had died. The searching of hospital records showed that the cases infected by this carrier had spent in hospitals, in the aggregate, 1,153 days, or approximately three years and two months. The field work went beyond any possible laboratory tests in showing that this carrier was much more dangerous than the average carrier, and, therefore, in need of special administrative attention.

Whatever difficulties arise in the detection of carriers, owing to the limitations of laboratory diagnosis and the lack of adequate field investigation, dwindle into insignificance beside the troubles of health officials who try conscientiously to isolate, or otherwise efficiently to control, all the carriers of serious contagious diseases who can be discovered. It is true that many carriers spontaneously cease to be such and some chronic carriers can be cured, but many of the reports of cures have undoubtedly been based on intermissions and the carriers have been released from restraint unchanged. Other apparent cures may be due to the interference of the method of treatment with the laboratory tests. For instance, there is a

greater chance of getting negative diphtheria cultures within twenty-four hours after treatment with staphylococcus spray than later.*

The most determined attempts to clear up chronic carriers sometimes meet with complete failure. For example, typhoid carriers sometimes continue to discharge typhoid bacilli after the surgical removal of the gall bladder.† Probably the best that health officials can now do is to release persistent chronic carriers with instructions regarding their occupations and habits, excepting the few specially dangerous carriers like the typhoid carrier already alluded to. Such carriers present almost insurmountable difficulties which must be faced.

Inasmuch as the detection and control of carriers has so far been filled with difficulties and productive of only slight results on the total amount of contagious disease, we should make a special effort to prevent the formation of carriers. After due discussion, we should modify our public health procedure with this in view.

A consideration of the sources from which carriers are infected is an important preliminary to the formation of plans for their prevention. Carriers of contagious diseases are infected by other carriers and by acute cases. In diphtheria we are apt to put great emphasis on the acute cases because so many carriers are detected among those who have been near them. We usually do not stop to consider that in some of these the carrier state may have antedated the acute cases and may have been responsible for them. We are apt also to regard the infection as traveling from the acute case direct to each of the other carriers. It seems more probable that, in a crowded household under the usual official quarantine, there is a repeated exchange of infection within a group of persons including carriers and acute cases. As an example of the prevalence of carriers in households containing acute cases, recent experiences of two of our California local health officers may be mentioned. In taking cultures from the contacts with diphtheria cases before raising quarantine, they found a large percentage of carriers. Examination of cultures at the State Hygienic Laboratory‡ showed that there were, in three of the households, a total of four acute or convalescent cases, sixteen carriers, and four persons whose cultures were negative.

Observations similar to the above are not infrequent and lead me to believe that the common procedure of officially enforced quarantine with optional isolation of the acute case from the remainder of the household must, in many instances, increase our carrier population enough to offset the advantage to the community from the quarantine. That the number

*Fay, Jewel. Staphylococcus Spray for Diphtheria Carriers, California State Journal of Medicine, May 1913, Vol. XI, pp. 197–199.

†Ledingham, J. C. G., and Arkwright, J. A. The Carrier Problem in Infectious Diseases, 1912, pp. 85–91

‡Monthly Bulletin of the California State Board of Health, February, 1913, Vol. 8, p. 197.

of carriers in a community is large in the presence of acute cases who have been quarantined, as far as the local health officers can enforce the law, is a well-known fact. In the absence of diphtheria cases about 3 per cent. of 350 students, coming to the University of California from all parts of the state, showed granular types of diphtheria bacilli, while, in the presence of an epidemic, 18 per cent. of 690 grammar school children at Hayward, California, showed diphtheria bacilli.* In order to diminish the production of carriers, health regulations should require the isolation of the acute case from the other members of the household, who should have only such additional restraint as may be indicated by the probability of their being in the stage of incubation or in the carrier state. Every attempt should be made to diminish the contact of known carriers with acute cases or with each other, as repeated infection may prevent or postpone the spontaneous recovery of the temporary carriers.

Carriers frequently receive their infection from other carriers. This was well illustrated during the investigation, already mentioned, of diphtheria at the Southern California State Hospital. In the first round of cultures 11.6 per cent. of the 1,115 inmates and employees gave positive cultures for diphtheria, and were put in the isolation cottage. There were no acute cases during the time of the investigation, as all the people in the hospital had been protected with diphtheria antitoxin. As the taking of cultures and isolation of carriers progressed the number of persons outside of isolation giving positive cultures dropped to 1.8 per cent. Then persons were gradually returned from isolation after they had given two or more negative cultures. The percentage of positive cultures steadily rose until it reached 11 per cent. and many of the released patients were found to give positive cultures. After the more permanent isolation of these intermittent carriers the percentage again fell rapidly.

Inasmuch as carriers may be infected by carriers, we should work to remove the conditions which favor the exchange of infection. The campaign against the public drinking cup is a step in the right direction. We must at present place our chief hope of greatly diminishing such diseases as epidemic cerebrospinal meningitis and epidemic poliomyelitis in the diminution of opportunity for exchange of infection, if we accept the growing opinion that epidemics of these diseases are essentially great increases in the number of carriers with here and there an acute case appearing as a comparatively rare accident.

In the experience at the Southern California State Hospital persons immunized with antitoxin were made carriers when exposed to other carriers. Many carriers date their condition from an acute attack which gave them a lasting immunity. Meningitis and poliomyelitis are supposed by many to be carried by persons who are unable to contract those diseases owing

*Monthly Bulletin of the California State Board of Health, February, 1913, Vol. 8, p. 197.

to the relative insusceptibility of the adult. Inasmuch as immunes may become carriers, they should be barred, like susceptible persons, from unnecessary contact with the sick. When immunes nurse the sick they should not be excused from adequate precautions against becoming infected.

A factor which would help health officials in handling the whole problem of contagious disease would be the keeping of records of known contacts with acute cases and the official exchange of information when these persons move from one jurisdiction to another. If contacts become temporary or chronic carriers or acute cases, the local health officer will be helped to discover them if he has a record of their opportunities for becoming infected. Recently the state board of health sent me to investigate the appearance of a severe disease which was causing great apprehension in a small town. A family consisting of a father, mother, and three sons had recently arrived from the middle west. Within a few days of their arrival one of the boys became seriously ill, and recovered slowly. Another son soon afterward became sick and died. At the time of my visit the third son was moribund from diphtheria which had not been recognized by the attending physicians. The parents stated that the boys had played with some sick children while coming to California in the train, and that a physician, who boarded the train, examined the children and had them removed. If those sick children were known or suspected of having diphtheria, the names and destination of the contacts should have been ascertained and reported to the local health officer, who should in turn have notified the health officer at the destination either directly or through the state board of health. I hope to see regulations made which will compel the keeping of records of contacts, which will help health officers to know what troubles to expect and to discover their source if they occur. Such measures, although not aimed chiefly at the prevention of carriers, will advance the time at which proper precautions against the spread of infection can be instituted and will prevent the forming of carriers in the interval.

The suggestions which have been presented are intended to stimulate discussion and investigation of the carrier problem with a view to devising more effective methods for reducing the amount of contagious disease. We require especially more local and state health officials who are trained to make scientific epidemiological field examinations so that our knowledge will be less strictly limited to the valuable, but restricted, information from the laboratory.

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INDUSTRIAL HYGIENE AND SANITATION.

Every forward movement in society, however productive of good, goes through a transitional period in its development marked by unsettled conditions. This has been true of industrial changes wherein unsettled conditions meant loss of human energy, and particularly true of the economic changes in the industrial world in Europe during the middle of the nineteenth century.

This movement was the transition from the guild system to the present factory system, a process whereby all the necessary elements of manufacture were concentrated: machinery, brains, brawn and capital. In the factory, one man with the aid of machinery began to do the work of several and thus increase product enormously. With increased product and highly developed machines and factories came increased danger to life. Never-

theless, increased efficiency and increased product for a long time remained the watch cry.

The pendulum always swings from one extreme to the other and in the straining effort for maximum results little corrective consideration was given to the safeguarding of life and limb. In this number of the JOURNAL an article by John B. Andrews of the American Association for Labor Legislation clearly states the problem of occupational diseases and legislative remedies. It has been estimated by experts that the United States, as well as certain other countries, loses millions annually from the sickness of laborers, not including the loss resulting from the effects of the laborer's sickness on the members of his family. The effects of the latter are many and productive of several long trains of economic disturbances, too numerous to go into at this time.

The pendulum has long since started on its swing in the other direction and although slow, it is moving. It could have been only a matter of time when the man at the machine would have to be regarded, not as a part of the machine, but as a human being and not only as a human being, but as one in need of protection from his environment, even from his own carelessness. It was soon noted that loss of efficiency in an employee entered greatly into the cost of production, and it behooved the employer to conserve the working man's power of production for financial reasons if not on the ground of humanity and decency.

Much has been done by many corporations and organizations for the safety, health and comfort of their working men and much more is planned and is being done. For these reasons, the JOURNAL is introducing a new department this month, "Industrial Hygiene and Sanitation," to assist in spreading methods, plans, innovations, and news of good already accomplished in this new and rapidly advancing field.

If you are wont to discount the efforts of some organizations along these lines because of underlying commercialism, you may remember that even if the employer does derive good interest on his investment in health preservation, also that society receives benefit from it irrespective of underlying motive.

We invite our readers' attention to this new department and ask for suggestions, articles and general information on this subject. If you are doing anything that would benefit any or all industrial workers, we shall be glad to pass the word along. The JOURNAL can be of great service through coöperation of both JOURNAL and its readers.

A STUDY OF THE GERMICIDAL ACTION OF THE ULTRAVIOLET RAYS.

E. M. Houghton, M. D., and Lewis Davis, M. S.,

From the Research Laboratory of Parke, Davis & Co., Detroit, Mich.

Read before the Laboratory Section, American Public Health Association, Colorado Springs, September, 1913.

I. Introduction.

The possibility of employing ultraviolet light as a sterilizing agent has received much attention within the past few years, particularly in respect to drinking water. It has been found that quantities of water as large as 600 litres an hour have been rendered bacteria free without difficulty, by exposure to the rays in one of the forms of apparatus now on the market for this purpose (8) (Westinghouse-Cooper-Hewitt). The cost and maintenance of the apparatus are, as yet, above the point where the process can enter into active competition with other forms of large scale water purification, but for small installations it has proved successful.

With liquids other than water, such as milk, beer, vinegar, etc., it has thus far been possible to obtain only a partial germicidal action. The applicability of the ultraviolet rays in sterilizing such substances as bacterial vaccines, bouillon, alkaloids, etc., has been studied but little. This investigation was, therefore, undertaken with the view of ascertaining the action of ultraviolet light particularly on these substances.

A résumé of the more important work in this field of sterilization shows that physical considerations, especially the distance of the liquids to be treated from the source of light, also the thickness of the liquid layers, maintain considerable influence. Cernovodeanu and Henri (1), who were among the earliest workers in this line, found that with bacterial emulsions the germicidal action of the ultraviolet rays decreases more quickly than the reciprocal value of the square of the distance of the liquids from the source of light. They also found the bactericidal action to be much stronger in a layer of liquid 25 cm. in thickness than in one of 2 cm. It did not change with a rise in temperature between 0° and 55°. In general, with water, no chemical or physical changes were observed, except, at most, a small rise of temperature on extended action. Essentially the same conclusions were arrived at in experiments conducted by the Royal German Experiment Station (15) and Courmont, Nogier, and Rochaix (10) in their investigation as to the presence of peroxide in water sterilized by ultraviolet light. Henri, Helbornner and de Recklinghausen (8), in a study of the sterilization of large quantities of water by the rays, point out the need of allowing sufficient time for the sterilizing action to take place. They suggest for the purpose the use of more than one lamp, and specify that the distance from the lamps to the treated water be as small as possible. Vallet (9), in a similar study, calls attention to the necessity of clarifying the water before

exposure, and recommends a sterilizing space sufficiently large to permit each particle of water to be exposed to the rays for at least one minute.

The problem of sterilizing milk by ultraviolet rays has been investigated to some extent, particularly by Romer and Sames (5), who used a Heraeus mercury-quartz lamp of six ampères strength. The milk to be sterilized was contained in a quartz vessel 15 cm. from the source of light, and the rays were allowed to act on a layer of the milk 1½ cm. in thickness. The number of bacteria was reduced from 98,900 to 2,050 per cc. after two and one-half hours of action; a second time, they were reduced from 111,800 to 65,000 in twenty minutes' action. With the longer time of action, the taste of the milk, even with incomplete sterilization, became irritating, while, after about an hour's illumination, the experimenters found a distinct destructive action on the oxidases. Butter fat, illuminated for one and three-fourths hours, showed a decrease of 7 per cent. in the iodine number.

An investigation of the action of ultraviolet light on Bact. tuberculosis and tuberculin has been made by Cernovodeanu working with Henri and Baroni (11). They placed an equally opalescent emulsion of the bacteria in a quartz tube rotating about the lamp. It was found that the organisms were strongly attacked, even after a short time, being entirely killed after ten minutes of continuous exposure. Tuberculin, exposed to the rays for five minutes or over, gave no reaction when applied to tuberculous guinea pigs.

Stassano and Lematte (13) in a series of experiments have found that emulsions of various bacteria, after illumination with ultraviolet light, showed the same index to the corresponding agglutinating sera as the living bacilli did. They observed that bacterial life was very quickly destroyed by the rays, but that the substances contained in them, as agglutinins, toxins, enzymes, etc., were not destroyed thereby. They conclude that compared with other methods of sterilization this process has the advantage of not affecting the agglutinins in any manner, and should, therefore, be especially suitable for the preparation of emulsions for sero-diagnostic purposes.

The action of ultraviolet rays on solutions used in pharmacy has been studied to some extent by Lesure (6). He found that almost all were as easily penetrable as water, but that the sterilizing action was not the same, using B. coli communis as a test organism. Also using the colon bacillus, Vallet (4) found that dextrose and lactose solutions, glycerine, ethyl alcohol until the appearance of its own bactericidal action, acetic and tartaric acids, were made germ free when illuminated for one minute in a layer 1.5 mm. in thickness. A 30 per cent. salt solution, 22 per cent. soda solution, and 19 per cent. calcium nitrate solution were sterilized under the same conditions. However, the ultraviolet rays were held back andsterilization did not take place when the light had to penetrate a few drops of oil, or when the solution contained 3 per cent. peptone or 1 per cent. albumin.

II. Laboratory Data.

A. *Apparatus and Technique Employed.*

In our work with the ultraviolet rays, we used as a source of light a Cooper-Hewitt Standard "Type Y" Quartz Lamp, arranged as shown in Fig. 1 (A). The material to be illuminated was contained in a glass flask (B), connected by a sterile, glass syphon and rubber tubing with screw clamps

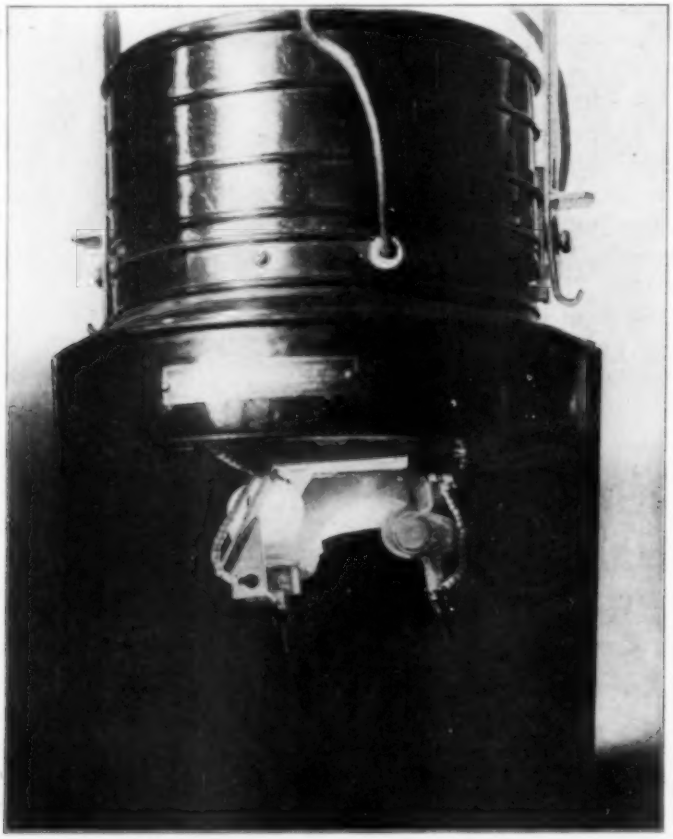

Fig. 1 (A).—Cooper-Hewitt Quartz Lamp as used for Sterilizing.

to the trough (C) placed directly beneath the arc. After exposure in the trough, the liquid passed through the delivery tube (D) into a previously sterilized container (E). The arrangement, as used for sterilizing bacterial vaccines, is shown in Fig. 2 with the protective cover in place.

In use, the lamp first caused a heavy drop in voltage with consequent high current which steadily diminished, becoming constant after about six minutes. This is seen from the following electrical data:

Initial voltage (line)	120 volts
Initial voltage with lamp	34 volts
Voltage with lamp (after 6 minutes)	85 volts
Voltage with lamp (after 15 minutes)	85 volts
Initial current	8 ampères
Current (after 6 minutes)	3.5 ampères
Current (after 15 minutes)	3.5 ampères

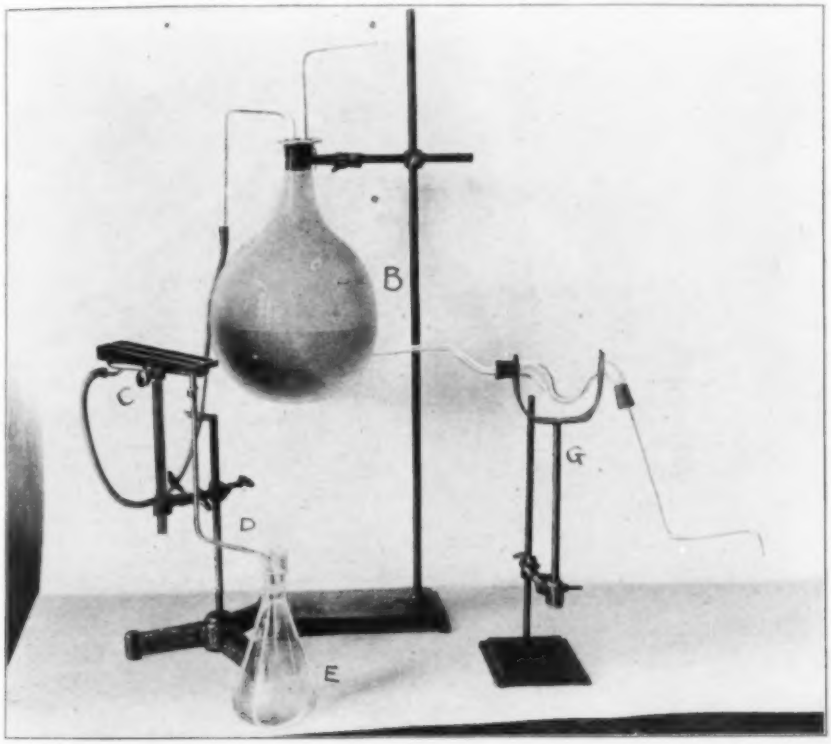

Fig. 1 (B).—Apparatus used with Ultraviolet Light Showing Special Trough and Tube.

During the operation of the arc, there was a large amount of heat generated which was shown by a rise from 24°C. to 117°C. in fifteen minutes, the bulb of the thermometer being 6 cm. from the source of light.

As may be partly seen in Fig. 1 (C), the liquids were exposed to the rays in a special, rectangular trough, 15½ cm. x 4 cm., divided into two equal portions by a central septum. The fluid entered at one corner through a tube .5 cm. in diameter and bent at right angles, the trough at this point having a depth of 1.5 cm., but tapering at its other end to 0.8 cm. After flowing through one side, the liquid passed back to the other side by means

of a diagonal tube 0.7 cm. in diameter, which thus subjected it to a second exposure to the rays. From here, it passed out by means of the bent delivery tube (D) connected to the trough by a union. The whole arrangement was made of brass, heavily nickel plated, with rounded inside corners, allowing both trough and delivery tube to be sterilized by heating in the free flame. In addition to this the trough was provided in its center with a metal standard and an adjustable screw clamp, thus permitting it to be fixed in any desired position.

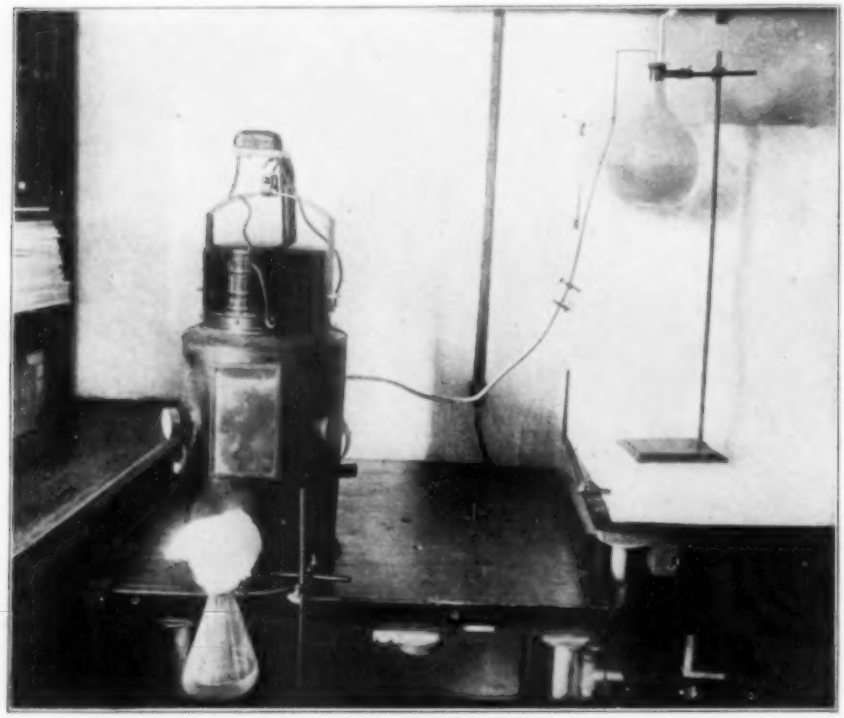

Fig. 2.—Complete Apparatus for Sterilization by Ultraviolet Light.

In most of the work on water the liquid was exposed to the rays in a special bent quartz tube as shown in Fig. 1 (G), provided with a brass holder and having previously sterilized glass inflow and outflow tubes connected through sterile rubber stoppers. As in the case of the trough, the quartz tube could be sterilized by heating in the free flame. It also permitted a greater rate of flow, but owing to the ease of breakage and difficulties in adjustment, the metal device was found to be much more satisfactory as well as economical.

The usual techinque consisted in first running through the apparatus

about two litres of sterile water into a graduated cylinder. Not only did this serve as a means of regulating the rate of flow, but allowed the lamp to reach the optimum working conditions and, at the same time, cleaned the apparatus. Without breaking the sterile syphon, the material to be tested was now substituted in place of the water, and connected up as shown in Fig. 2. The liquids, after being exposed, were collected under aseptic conditions in previously sterilized containers, and portions removed to suitable vessels for bacteriological examination.

With the exception of the tap water, the bacterial suspensions and vaccines, B. coli communis was used as the test organism for determining the germicidal action of ultraviolet light on the various solutions studied. The inoculation was made in each case by adding to the material an aqueous suspension of the bacillus, shaking well for several minutes, and then estimating the number of bacteria present by plating out 1 cc. samples in various dilutions on suitable culture media.

B. *The Action of Ultraviolet Lighton Various Substances.*

1. *Detroit Tap Water.* Our experiments with the city water supply were carried on during a time when the water was highly turbid, owing to melting ice and heavy winds. There was also a considerable amount of humus material present, giving the water a dark color.

The bacterial content of the water before exposure was obtained by plating out 1 cc. samples in plain agar, and incubating for forty-eight hours at 20°C. After exposure, 5 cc. samples of the treated water were examined. To make sure of the sterility of the media, controls were run at the same time with 5 cc. of sterile water. The results are given in summary in Table I.

The preceding table seems to establish that tap water with considerable matter in suspension and having a bacterial content of 800 organisms per cc., can be sterilized by exposure to ultraviolet rays in a quartz tube at a rate as high as a litre in thirty-eight seconds. Considering the price of electrical energy at 1½ cents per K.W.H., this means that 24 gallons can be sterilized in an hour at about 0.5 cent for cost of power. More data on the comparative cost of water sterilization by ultraviolet rays can be found in the recent studies of M. Recklinghausen (21), and I. J. Tanton (28).

As would be expected, if the flow of the liquid be slowed down, the heating effects of the lamp are noticeable as in Nos. 11, 12, 13, 21, 22, 23, 42, 43, 44. In fact, where the rate was a litre in forty minutes (Nos. 21, 22, 23), there was a rise of 34°C. in temperature during passage through the apparatus, giving a final temperature of 60°C.—almost sufficient to bring about a decided germicidal action through heat alone. This fact would be of importance in the case of sterilization of bacterial vaccines.

2. *Aqueous Suspensions of Bacteria.* The presence of B. coli communis in 0.1 cc. samples of the tap water used in our experiments brought up the

TABLE I.

ACTION OF ULTRAVIOLET LIGHT ON DETROIT TAP WATER.

	Number of Colonies before Exposure in 1 cc.	Flow in Minutes per Litre.	Number of Colonies after Exposure in 5 cc.	Rise in Temperature of Water.
1	650	Control	Control	
2	580	"	"	
3	520	"	"	
4	Sterile water	"	0	
5	As in 1, 2, 3	1.5	0	0
6	" " " " "	1.5	0	0
7	" " " " "	1.5	0	0
8	" " " " "	4	0	0
9	" " " " "	4	0	0
10	" " " " "	4	0	0
11	" " " " "	10	0	4°
12	" " " " "	10	0	4°
13	" " " " "	10	0	4°
14	500	Control	Control	
15	450	"	"	
16	470	"	"	
17	Sterile water	"	0	
18	As in 14, 15, 16	3.3	0	0°
19	" " " " "	3.3	0	0°
20	" " " " "	3.3	0	0°
21	" " " " "	40	0	34°
22	" " " " "	40	0	34°
23	" " " " "	40	0	34°
24	800	Control	Control	
25	720	"	"	
26	730	"	"	
27	As in 24, 25, 26	0.63	0	0°
28	" " " " "	0.63	0	0°
29	" " " " "	0.63	0	0°
30	" " " " "	0.72	0	0°
31	" " " " "	0.72	0	0°
32	" " " " "	0.72	0	0°
33	" " " " "	1.0	0	0°
34	" " " " "	1.0	0	0°
35	" " " " "	1.0	0	0°
36	" " " " "	2.1	0	0°
37	" " " " "	2.1	0	0°
38	" " " " "	2.1	0	0°
39	" " " " "	4	0	0°
40	" " " " "	4	0	0°
41	" " " " "	4	0	0°
42	" " " " "	14	0	12°
43	" " " " "	14	0	12°
44	" " " " "	14	0	12°
45	Sterile water	Control	0	

question as to the sterilizing action of the rays on pure cultures of this organism. Various aqueous suspensions of B. coli communis, ranging from 89,000 colonies per cc. to 777,000 per cc. were exposed to ultraviolet light at different rates of flow up to a litre in forty-two seconds. In each case,

5 cc. samples plated out on agar showed no colonies when incubated for three days at 37°C.

To ascertain whether equally efficient results could be obtained with a spore-forming organism, experiments similar to those with the colon bacillus were run with B. subtilis alone, and with mixtures of B. subtilis and B. coli communis, each in numbers of about 200,000 bacteria per cc. Complete sterility was obtained in every case, even with a rate of flow of a litre in thirty-nine seconds.

3. *Beef Bouillon.* The feasibility of sterilizing albuminous liquids by ultraviolet rays was studied with ordinary beef bouillon as used for cultural purposes. To decrease the content of albumins and make the color as light as possible, the bouillon was prepared without the ordinary 2 per cent. peptone, sterilized in streaming steam and then inoculated with B. coli communis in the usual manner. The various experiments and results obtained are given in Table II, based on 1 cc. samples on agar, incubated for twenty-four hours at 37°C.

It is easily seen from Table II that the Cooper-Hewitt mercury arc cannot be used for sterilizing bouillon, even with a rate of flow as slow as a litre in ten minutes. Ten minutes for a litre to flow through can be considered the slowest practical rate allowable. Beyond this point the heating effects of the lamp come into consideration.

As may be noted from Nos. 34–39, the percentage reduction (35 per cent. to 60 per cent.) was not so high with more bacteria present, than when bouillon containing less bacteria (Nos. 24–29) was exposed to the rays. In the latter case, not only was the reduction somewhat greater (55 per cent. to 65 per cent.) but was also more uniform. The bouillon, itself, also seemed to have a slightly burnt odor after exposure to the ultraviolet light.

4. *Bismarck Brown.* The fact that the bouillon was colored brought up the question as to the effect of color on the action of the rays. To determine this point, water was colored with Bismarck brown till it was equal in intensity to a dark bouillon. It was then infected with B. coli communis and run through the apparatus in the usual manner. With rates of flow as high as a litre per minute, complete sterilization took place. Control samples showed that there were about 250,000 organisms per cc. before exposure.

5. *Sodium Chloride.*

6. *Saccharose.* Our experiments with tap water seemed to indicate that dissolved salts did not interfere with the germicidal action of the mercury arc. This fact was confirmed by exposing to the rays a 1 per cent., a 2 per cent., and a 4 per cent., aqueous solution of common salt, containing as high as 450,000 colon bacilli in every cc. The highest rate of flow was a litre per minute. In every case, 5 cc. samples of the liquid after exposure failed to show any organisms present.

That ionization of the dissolved material has no influence on the sterili-

TABLE II.

ACTION OF ULTRAVIOLET LIGHT ON B. COLI COMMUNIS IN BOUILLON SUSPENSION.

	Number of Colonies before Exposure.	Flow in Minutes per Litre.	Number of Colonies after Exposure.
1	200,000	Control	Control
2	220,000	"	"
3	240,000	"	"
4	As in 1, 2, 3	10	*
5	" " " " "	10	*
6	" " " " "	10	*
7	" " " " "	7	*
8	" " " " "	7	*
9	" " " " "	7	*
10	Control on media		
11	500,000	Control	Control
12	510,000	"	"
13	490,000	"	"
14	As in 1, 12, 13	2.3	*
15	" " " " "	2.3	*
16	" " " " "	2.3	*
17	" " " " "	6	*
18	" " " " "	6	*
19	" " " " "	6	*
20	Control on media		0
21	18,000	Control	Control
22	20,000	"	"
23	21,000	"	"
24	As in 21, 22, 23	2	7,500
25	" " " " "	2	7,200
26	" " " " "	2	7,800
27	" " " " "	1.4	8,500
28	" " " " "	1.4	8,700
29	" " " " "	1.4	8,700
30	Control on media		0
31	750,000	Control	Control
32	730,000	"	"
33	710,000	"	"
34	As in 31, 32, 33	10	320,000
35	" " " " "	10	340,000
36	" " " " "	10	300,000
37	" " " " "	10	440,000
38	" " " " "	10	490,000
39	" " " " "	10	380,000
40	Control on media		0

*Indicates more than 1,000 colonies on plate.

zation was shown by experiments with saccharose—a typical non-electrolyte. A 4 per cent. aqueous solution of the sugar was employed,—the technique being exactly the same as in the case of the sodium chloride. Here also, we found it possible to sterilize with 400,000 B. coli per cc. present before exposure.

7. *Urea.* The results obtained with saccharose raised the question as to the effect of the presence of nitrogen on the sterilizing action, since saccharose is a carbohydrate. For this purpose, a 1 per cent. aqueous

solution of urea ($CO(NH_2)_2$) was infected with B. coli communis, the control plates showing 50,000 bacteria per cc. The organisms were found to be entirely killed with rates of flow up to a litre in two minutes. The action at more rapid rates was not studied, but, in all probability, complete sterilization would have been affected.

8. *Glycocoll.* The possible influence on the action of the rays of the simultaneous presence of carboxyl and amino groups in a molecule was studied with a 2 per cent. aqueous solution of the simplest amino acid,—glycocoll ($H_2N–CH_2–CH_2–COOH$). In spite of the large number of organisms used in infecting—4,200,000 per cc.—rates of flow of a litre in four, three, and two minutes, respectively, gave no growths when 5 cc. samples of the exposed solutions were plated out on agar at 37°C.

9. *Leucin.*

10. *Alanin (alpha).* Our studies with leucin were undertaken to see whether the length of the molecule as well as its arrangement had any influence on its sterilization by ultraviolet light. Leucin (α aminoisocaproic acid) with the formula, $(CH_3)_2CHCH_2CH(NH_2)\,COOH$, is one of the more difficultly soluble higher amino acids. A 1 per cent. solution of the acid in water was used, and inoculated with the colon bacillus as usual, so that there were about 470,000 bacteria per cc. However, when exposed to the rays at the rate of a litre in four minutes, it was found impossible to sterilize it.

As may be noted from its formula, leucin has a methyl side chain in its molecule. To make sure that the interference was not due to this methyl group, experiments similar to those with leucin were run with a 1.5 per cent. solution of Kahlbaum's α alanin,—the simplest α amino acid having a methyl side chain, $(CH_3)_2C^*H(NH_2)COOH$. The number of organisms present before sterilization was about 2,000,000 per cc., and the maximum rate of flow was a litre in two minutes. In every case, the sterilization was found to be complete, showing that the methyl side chain had no influence on the action.

A test of the leucin solution used in our preceding experiments with Millon's reagent gave a distinct red color, showing the presence of proteins. Accordingly, another series of experiments was run with leucin, this time using Kahlbaum's highest purity product. The content of colon bacilli, as shown by control plates, was about 900,000 per cc. with a maximum rate of flow of a litre in two minutes. This time 5 cc. samples of solution after exposure failed to give any colonies on agar, showing that the poor results previously obtained were due entirely to protein compounds admixed with the leucin.

11. *Cocaine Hydrochloride.* The germicidal action of ultraviolet light on alkaloids was studied with 1 per cent. and 2 per cent. solutions of cocaine hydrochloride in water. One set of solutions was made up with sterile water and with B. coli communis as usual, while the other set was

made up with clear tap water, to which was added a mold (*Penicillium glaucum*).

In the series where the colon bacillus was used, the number of organisms present ranged from 19,000 per cc. to 160,000 per cc. before exposure to the rays. After the illumination, with a rate of flow of a litre in ten minutes, the number of bacteria remaining was from 200 in every cc. to several thousand per cc. With more rapid rates of flow, the number of organisms remaining ranged much higher.

Even at the slowest rates of flow, the solutions infected with the mold showed apparently no reduction in colonies after exposure to the rays. From the results obtained with cocaine, it would seem that the alkaloids, probably on account of their high molecular weight, do not permit of sterilization by the ultraviolet rays. Comparative tests of its anæsthetic properties on dogs before and after exposure to the ultraviolet light showed that the cocaine hydrochloride was not materially affected. Both with the bacteria and mold, the action seemed to be the same in the 1 per cent. as in the 2 per cent. solutions.

12. *Suspensions of Mold in Water.* The poor results obtained with the cocaine solutions containing mold brought up the question as to the action of ultraviolet rays on mold. For this purpose, aqueous suspensions of different species of *Penicillium*, *Aspergillus* and *Mucor*, were prepared, so that the number of colonies, when properly diluted and sown on alkaline agar, ranged from about fifty to several hundred per cc. When exposed to the rays at a rate of flow as slow as a litre in twelve minutes only a small destructive action was obtained. The percentage reduction was greater where there were more fungi present before exposure, but in no case did it exceed 20 per cent. The data obtained seemed to show conclusively that mold cannot be killed by ultraviolet light, except when present in very small amounts, as one or two colonies per cc.

13. *Milk.* In our studies on the sterilization of milk by ultraviolet light, we used a Jersey milk, rich in butter fat, and about twenty hours old. The laboratory results are given in Table III. Both plain (P. A.), and litmus-lactose agar (L. L. A.) were used as culture media. One cc. samples were plated out and incubated for forty-eight hours at 37°C. The red colonies, as seen on the litmus-lactose agar plates have been designated by (r), and are given together with the total number of colonies on the plate.

Confirming the results of Romer and Sames (5), and those more recent of Huyge (18), Ayers and Johnson (32), Table III shows that the ultraviolet rays cannot be successfully used for sterilizing milk. This would have been expected from our results with bouillon. Huyge believes that the difficulty in the sterilization of milk is due to the colloids present.

At the slowest possible rate of flow—a litre in ten minutes—the greatest reduction in bacterial numbers was about 45 per cent. (No. 11). Where the organisms were not so numerous (Nos. 14–21), a still greater reduction

TABLE III.

THE GERMICIDAL ACTION OF ULTRAVIOLET LIGHT ON MILK.

	Number of Colonies before Exposure in 1 cc., P. A.	Number of Colonies before Exposure in 1 cc., L. L. A. X 1,000	Rate of Flow in Minutes per Litre.	Number of Colonies after Exposure in 1 cc., P. A.	Number of Colonies after Exposure in 1 cc., L. L. A X 1,000.
1	204,000	75(37r)	Control	Control	Control
2	189,000	53(28r)	"	"	"
3	196,000	52(33r)	"	"	"
4	As in 1, 2, 3	As in 1, 2, 3	2	130,000	84(49r)
5	" " " " "	" " " " "	2	140,000	80(52r)
6	" " " " "	" " " " "	2	143,000	79(46r)
7	" " " " "	" " " " "	5	120,000	65(40r)
8	" " " " "	" " " " "	5	126,000	69(38r)
9	" " " " "	" " " " "	5	119,000	62(36r)
10	" " " " "	" " " " "	10	115,000	54(32r)
11	" " " " "	" " " " "	10	109,000	67(46r)
12	" " " " "	" " " " "	10	110,000	50(32r)
13	Control on Media				
14	26,000	8.4(6.1r)	Control	Control	Control
15	24,000	9.2(6.0r)	"	"	"
16	30,000	11.0(7.2r)	"	"	"
17	As in 14, 15, 16	As in 14, 15, 16	7	10,000	4.9(3.1r)
18	" " " " "	" " " " "	7	9,500	4.6(2.9r)
19	" " " " "	" " " " "	7	9,200	4.8(3.2r)
20	" " " " "	" " " " "	7	9,100	4.0(3.2r)
21	" " " " "	" " " " "	7	9,800	4.2(2.7r)

was obtained—the highest being almost 70 per cent. in No. 20. Macroscopical and microscopical examination of the colonies on the litmus-lactose agar plates, both before and after exposure to the rays, showed a preponderance of the Bact. lactici acidi group after exposure. A curious fact which can be seen from the table (Nos. 4–12) is that there were more colonies growing on the litmus-lactose agar plates after exposure than before.

It would seem, then, that exposure of milk to ultraviolet rays has a tendency to kill off the undesirable organisms present, leaving the more desirable bacteria of the Bact. lactis acidi group in the majority. There was no perceptible change in the taste of the milk after being illuminated.

14. *Wine.* Contrary to what might be supposed from the preceding work, it was found possible to completely sterilize wines by the ultraviolet rays. The wines used in our experiments were a Tokay and a Sherry, each containing about 16 per cent. alcohol, and both colored. On account

of the relatively high percentage of alcohol, the infecting organism in this case was a spore-forming bacillus of the B. subtilis group, already present in the Sherry wine when obtained. This bacillus was isolated in pure culture and was also used for infecting the Tokay wine.

The number of infecting organisms ranged from about 25,000 to several million per cc. as shown by plating out on dextrose agar at 37°C. The best rate of flow seemed to be about a litre in five minutes. Slower rates imparted a sort of burnt taste to the wines, while higher rates did not permit of complete sterilization. Confirming our results with Bismarck brown, the dark color of the Sherry wine did not seem to interfere with the germicidal action of the rays.

15. *Adrenalin Chloride Solution.* Our work with Adrenalin Chloride was mostly with a 1:3200 aqueous solution preserved with chloretone. Several experiments with solutions in which the chloretone had been removed seemed to indicate that sterilization was possible when the liquid was exposed to the rays at the rate of a litre in six minutes. B. coli communis was used as the test organism.

However, after exposure to the rays the adrenalin solutions showed a distinct red coloration, indicative of deterioration. Physiological assays by injection into the circulatory system of dogs, both before and after the illumination, showed that after exposure there is a loss of 30 per cent. in the physiological activity. The action is probably one of oxidation. More work with this substance is contemplated.

16. *Bacterial Vaccines.* Our previous work showed that ultraviolet light could be used to sterilize salt solutions. This suggested the use of the rays in the preparation of bacterial vaccines. As would be expected, the rate at which the vaccine is exposed to the rays is of the greatest importance, owing to the large number of organisms present. Where the number was fifty million or more per cc. the minimum rate at which we found complete germicidal action to take place was a litre in five minutes. With streptococci and the micrococci (staphylococci), slower rates were necessary to kill all of the organisms. A rate of flow of a litre in eight minutes seemed to be the most satisfactory for all of the vaccines studied.

In preparing the vaccines, the organisms were grown as usual on the appropriate culture media for the necessary length of time. The growth was then washed off with sterile physiologic salt solution, the bacterial numbers estimated by Wright's method, and the suspension diluted with sterile salt solution to give the desired number of organisms per cubic centimeter. After shaking for at least half an hour, in a shaking machine, the diluted suspension was exposed to the ultraviolet rays, and run directly into a sterile container under aseptic conditions. The preliminary shaking was found to be absolutely necessary with the streptococci, probably due to clumping of the organisms and thus escaping the action of the rays.

We have prepared in this way the following vaccines:

THE ACTION OF ULTRAVIOLET LIGHT ON VARIOUS SUBSTANCES.

Substance.	Number of Organisms per cc. before Exposure.	Rate of Exposure to Rays Minimum per Litre.	Number of Colonies per cc. after Exposure.	Changes Produced.
1. *Detroit tap water.* (Highly turbid).	400–800	38 sec.	Sterilized	None
2. *Aq. suspensions.*	80,000–777,000	42 sec.	Sterilized	None
B. coli communis.	170,000–400,000	39 sec.	Sterilized	None
B. subtilis.	400,000	39 sec.	Sterilized	None
B. subt. & B. coli.	18,000–750,000	1.4–10 Min.	7,500–490,000	Slight burnt odor
3. *Beef bouillon.*	B. coli com.			
4. *Bismarck brown sol.*	250,000	1 Min.	Sterilized	None
	B. coli comm.			
5. *Sodium chloride*, 1%, 2%, 4% aq. sol.	48,000–450,000	1 Min.	Sterilized	None
	B. coli comm.			
6. *Saccharose* 4% aq. sol.	400,000	1 Min.	Sterilized	None
	B. coli comm.			
7 *Urea.* 1% aq. sol.	10,000–50,000	2 Min.	Sterilized	None
	B. coli comm.			
8. *Glycocoll* 2% aq. sol.	670,000–4,200,000	2 Min.	Sterilized	None
	B. coli comm.			
9. *Leucin* (impure) 1% aq. sol.	470,000	4 Min.	Unsterilized	None
	B. coli comm.			
Leucin (Kahlbaum's Best) 1% aq. sol.	900,000	2 Min.	Sterilized	None
	B. coli comm.			
10. *Alanin* (alpha) 1.5% sq. sol	2,000,000	2 Min.	Sterilized	None
	B. coli comm.			
11. *Cocaine hydrochloride.* 1% and 2% aq. sol.	19,000–160,000	10 Min.	200–2700	None
	B. coli comm.		B. coli comm.	
	200 mold.		180 mold.	
12. *Suspension of mold in water.*	50–260	12 Min.	44–220	None
13. *Milk* (Jersey).	24,000–240,000	7–10 Min.	9,100–143,000	None
	(48 hour, 37°, count)			
14. *Wines* (*Sherry and Tokay*)	25,000–2,900,000	5 Min.	Sterilized	None.
	(B. subt. group)			Burnt taste with rates faster than 5 min.
15. *Adrenalin chloride sol.* sol. (1:3200).	60,000	6 Min.	Sterilized	Red Coloration 30% loss in physiological activity.
	B. coli comm.			
16. *Bacterial vaccines.*				
a) *Colon.*	a) 50,000,000	a) 5 Min.	a) Steril.	None
b) *Colon-typh.*	b) 100,000,000	b) 7 "	b) "	"
c) *Colon (comb.)*	c) 400,000,000	c) 8 "	c) "	"
d) Strep. (")	d) 50,000,000	d) 10 "	d) "	"
e) Staph. (")	e) 500,000,000	e) 10 "	e) "	"
f) Gonor. (")	f) 900,000,000	f) 10 "	f) "	"

1 Colon vaccine—50,000,000 bacteria per cc.
2 Colon-typhoid vaccine —100,000,000 bacteria per cc.
3 Colon vaccine (combined)—400,000,000 " " "
4 Streptococcus vaccine " — 50,000,000 " " "
5 Staphylococcus " " —500,000,000 " " "
6 Gonorrheal " " —900,000,000 " " "

Sterility was shown in each case by the absence of any growth when 5 cc. samples were sown in plain and dextrose agar at 37°C. Owing to the high turbidity and the very great number of organisms present, it was found necessary to use a rate of flow of a litre in ten minutes with the gonorrheal vaccine. Ascitic agar was used here to determine the sterility. All of the vaccines were preserved in the regular manner by the addition of 0.2 per cent. tricresol.

It is thought by some investigators that the usual method of preparing vaccines by heat impairs the keeping qualities and the power of producing antibodies. (Cf. Semple and Matson (27)). On the other hand, the excess of chemicals which might be required to effect sterilization may produce irritation. Theoretically, then, vaccines prepared by ultraviolet light should possess superior therapeutic action. A clinical study, using several vaccines so prepared, is being made with a view of determining this point. This, together with more researches on ultraviolet light sterilization, we hope to report upon in a future publication.

III. Discussion.

Several theories have been advanced as to the mode of action of the ultraviolet rays. The hypothesis advanced by Glaser (14) seems to be plausible. He explains it on the photo-mechanical theory, that by the continued action of ether vibrations on the organisms, the number of vibrations is brought to a point of rupturing the chemical combinations.

We have noticed, in our own work, the formation of ozone during the burning of the mercury arc. This can be detected by the odor, or by the fact that strips of moistened potassium-iodide starch paper placed in the vicinity of the rays are turned blue. The theory has be advanced that the germicidal action of the rays is due to the formation of ozone or hydrogen peroxide. Oker-Blom (25), from recent ultraviolet light studies with a Nogier-Triquet mercury arc, concludes that the germicidal effects have no basis as being due to the action of nitrous acid, ozone or hydrogen peroxide. It must rather be considered as the direct action of short-wave rays on the living bacterial protoplasm. It may be possible that the action can also influence secondary chemical reactions taking place through the agency of ultraviolet light.

The fact that secondary chemical changes may be produced by the rays was seen from the change we found in the adrenalin chloride solutions after the exposure. Berthelot and Gaudechon (23) have found that the rays are able to decompose solutions of levulose, while acetone is partly changed to acetic acid. Massol (19) has found that under the action of ultraviolet, starch gradually loses its tinting power with iodine. More recently Euler and Ryd (22) have found that lactic acid undergoes, through the agency of ultraviolet rays, a splitting up which may be considered analogous to the fermentative cleavage of this acid. Similarly, carbon dioxide is split off from tartaric acid by the action of the rays, a reducing substance being formed at the same time.

As noted, particularly with the bacterial vaccines, turbidity rapidly decreases the germicidal action of the rays. However, as Oker-Blom (24) has also found with water, if the turbidity be not too high, it is still possible

to sterilize with decreased rates of flow. Our work with vaccines also showed that bacteria have a varying resistivity to the action of the rays. The streptococci and staphylococci were the most difficult to kill, while the spore forming types offered no apparent resistance. Confirming our own results, Oker-Blom finds that color due to Vesuvine does not materially affect the sterilization.

Considerable discussion has arisen of late in regard to the most efficient type of lamp from the germicidal point of view. Two general types of mercury arc sterilizers can be distinguished, viz.:

1. The "over-water" type or "non-immersed" type, where the arc is above the material to be acted upon. The Westinghouse-Cooper-Hewitt lamps, similar to the one used in our own experiments, are of this kind.

2. The "under-water" or "immersed "type, where the arc is immersed in the fluid to be illuminated. The Courmont-Nogier and Nogier-Triquet lamps are of this type.

Theoretically, the immersed type should be more efficient, owing to all of the rays being utilized, and the elimination of the intervening air space. On the other hand, the "over-water" type is more adaptable for acting on materials other than water. By burning at a higher temperature, it also produces a greater amount of the shorter or germicidal rays. For large-scale water sterilization, it would seem that the Nogier-Triquet type is more suitable, while for general, small-scale sterilization, the Cooper-Hewitt (non-immersed) type seems to be more efficient. An able discussion of this point is to be found in a recent article by Nogier (27).

IV. Conclusions.

A. The ultraviolet rays produced by the Cooper-Hewitt mercury arc have a strong bactericidal action.

B. Certain species of bacteria in aqueous suspension, including spore-forming organisms, are killed by exposure to the rays. Molds, however, are only partially destroyed by the ultraviolet light.

C. The action seems to be a photo-mechanical process, and is, in all probability, due to absorption of the ultraviolet rays by the bacterial protoplasm.

D. Water, wines, many inorganic, and a number of organic substances in aqueous solution, can be sterilized by ultraviolet light. Bacterial vaccines require a prolonged action.

E. Proteins and other bodies of high molecular weight interfere with the action of the rays. Turbidity, both organic and inorganic, has a similar action. Color, within certain limits, seems to have no influence.

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A SERIOUS FALLACY OF THE "STANDARD" METHYLENE BLUE PUTRESCIBILITY TEST.

DR. ARTHUR LEDERER,
Chemist and Bacteriologist, the Sanitary District of Chicago.

Read before the Laboratory Section, American Public Health Association, Colorado Springs, September, 1913.

Spitta and Weldert's* methylene blue putrescibility test is employed as a routine procedure in this country to the almost complete exclusion of any other test of this kind. The test has been investigated in particular by Phelps and Winslow,† Clark and Adams,‡ and Jackson and Horton.§ Phelps‖ has given the test a quantitative expression by the introduction of "relative stability" figures, which are intended to indicate the percentage of oxygen available to that required for the complete oxidation of a sewage or effluent. It is obvious that the introduction of this relative quantitative feature has added importance to the method.

According to Phelps and Winslow, the end-point of the test coincides fairly closely with the elimination of the nitrate and nitrite oxygen. However, study of the experimental work of the various investigators points to a wide range of variations permitted in the practical application of the test. This leads to the inquiry whether the interpretation of the reaction under all conditions could be one and the same or whether the efficiency of the test has been overestimated as applied at present. C. B. Hoover¶ shows in tabulated form the variations in the application of the test among sewage laboratories with reference to temperature and time of incubation and seal of bottle, which clearly demonstrates lack of uniformity. He makes no mention, however, of the varying quantities of methylene blue employed by different observers. Clark and Adams, in investigating the time required for the decolorization of a large number of dyes in sewage mixtures, found that the amount of dye used within reasonable limits is not important, since samples with twice the amount of dye introduced usually were decolorized in the same period of time. Weldert and Spitta called attention originally to the fact that the amount of methylene blue solution should be constant if a comparative expression of the method is desired. They also stated that the quantity of the methylene blue solu-

*Mitt. kgl. Prüfungsanst. Wasserversorgung, Heft 6, p. 160.
†J. Infect. Dis., Suppl. 3; May, 1907.
‡J. Am. Chem. Soc., Vol. 30, p. 1037.
§J. Ind. Chem. Eng. Vol. 1; June, 1909.
‖Contr. Sanit. Research Lab. and Sewage Exp. St., Vol. 5, p. 74.
¶Eng. News, Vol. 68, p. 452.

tion should be just low enough to give to the liquid a noticeable blue color. The amount which they added was 0.3 cc. of a 0.05 per cent. aqueous methylene blue solution (B. extra Kahlbaum) to 50c c. of the liquid to be examined. Jackson and Horton found that variations in the amount of coloring matter used result in noticeable difference of the time required for the decolorization on account of the slight antiseptic action of the dye. Therefore, they also recommended the use of as little of the dye as possible. The quantity they applied was 1.0 cc. of a 0.05 per cent. watery solution to 250 cc. of the liquid to be examined.

I have recently been led to look into this point somewhat closer in connection with an investigation of the "Relation of the Nitrates to the Putrescibility of Sewages,"* and I was surprised to find how widely differing results can be obtained by varying the quantity of the dye. Indeed, the results obtained were so striking as to clearly call for an adjustment of the point in question if the test is to be retained as a fairly accurate expression of the relative oxygen requirements of a sewage, effluent, or contaminated water.

The amount of methylene blue employed by the various observers has been recorded as follows:

	Methylene blue solution.		Capacity bottle.	Cc. of 0.05 per cent. methylene blue sol. calc. per 150 cc. bottle cap.
	cc.	Per cent. strength.		
Spitta and Weldert.....	0.3	0.05	50	0.9
Jackson and Horton	1.0	0.05	250	0.6
Phelps and Winslow	1.0	0.10	250	1.2
St. meth. of water analysis	1.0	0.05	150 to 200	1.0 to 0.75

From this tabulation it appears that the amount of 0.05 per cent. methylene blue solution varies from 0.6 to 1.2 cc. per 150 cc. bottle capacity. The "Standard Methods" permit variations of 25 per cent. in the quantity of the dye. I have made no systematic inquiry into the exact proportions used by the various laboratories in this country. However, I have had sufficient opportunity to satisfy myself that generally little stress is laid on a definite ratio of methylene blue solution and bottle capacity.

At first, I was inclined to look to the brand of the dye employed as the cause of discrepancy, but repeated comparative tests carried on with four

*J. Infect. Dis., Vol. 13, No. 2.

TABLE I.

COMPARISON OF FOUR BRANDS OF METHYLENE BLUE.

Cc. m. bl. sol. per 130 cc.	Relative stability obtained with methylene blue from											
	M.	G.	H.	W.	M.	G.	H.	W.	M.	G.	H.	W.
0.25	9	9	8	9	.....	.....	.....	.....	9	9	9	9
0.50	15	15	15	15	19	19	19	19	11	11	11	11
0.75	17	17	17	17	22	22	23	22	12	12	12	12
1.00	.....	.....	.....	.....	25	25	25	25	17	16	17	17

different brands of the dye gave always identically the same results. There was evidently no noticeable difference in the germicidal effect of the brands which I compared.

The four brands were:

Methylene blue (double-zinc salt), Weiler-ter Meer Co.
Methylene blue, B.B. Conc. Farbwerke Hoechst Co.
Methylene blue, Mercks Medicinal, Highest Purity.
Methylene blue, Gruebler.

A 0.05 per cent. watery solution was prepared of each of the above brands and varying quantities of the solution added to bottles holding exactly 130 cc. of a sewage mixture. All of these samples and the samples in all of the following experiments were incubated at 20° C. The result of this comparative test can best be noted in Table I.

TABLE II.

TESTS ON RIVER WATER TO SHOW VARIATIONS OF STABILITY WITH CONCENTRATION OF METHYLENE BLUE.

Cc. meth. bl. sol. per 150 cc. capac.	Relative Stabilities.									
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
0.30	24	21	22	16	20	22	25	.....	.....	.....
0.55	.....	.....	.....	.....	.....	.....	.....	43	21	21
1.00	77	75	64	35	39	98	65	56	36	34

M. represents the Merck, G. the Gruebler, H. the Hoechst, and W. the Weiler-ter Meer brand. A larger number of such tests not recorded here have been made with essentially the same result.

This point being settled, I choose the Weiler-ter Meer brand for all my further work. These tests brought out clearly the fact that the relation of the concentration of the dye to the bottle capacity is of great importance. I had noted this on several previous occasions while working with a polluted river water. Some of the results obtained with river water are given in Table II.

Apparently there is no definite ratio between the stability figures and the different amounts of the methylene blue solution. However, a river water as a rule contains more or less colloid in the form of finely divided clay which may eliminate the color wholly or partly through adsorption. This phenomenon makes it very difficult at times to obtain reliable results, since the dye appears only as a precipitate at the bottom of the bottle. If there is much coarse sediment present in addition, the blue precipitate cannot be observed at all. The supernatant liquid may be completely colorless, yet a water of this kind is very likely to show a relative stability of 100. In many cases, good results may be obtained by permitting the colloidal matter to floc together and settle to the bottom, before adding the methylene blue solution. The coloring matter if added with a pipette will readily diffuse, without any mixing by shaking. The loss of a few hours in the time required for the decolorization of the sample may be of little importance, inasmuch as the relative stability of river waters as a rule is fairly high. With experience, it is possible to obtain fairly close results by noting the decolorization of the sediment at the bottom of the bottle, provided no other dark sediment be present, either sludge or algæous growth. Of course if an excess of the dye is added, part may be retained in solution in such waters. But in the light of my observations, such a procedure would furnish entirely erroneous results. One might just as well omit the actual test and hazard a guess on the result. It is very likely that an adsorption, such as that spoken of, occurs more or less with all surface waters unless they be entirely devoid of colloids. An adsorption may be hardly noticeable, yet it may be just sufficient to make the sample appear putrescible to the casual observer while in fact it may be non-putrescible.

Table III shows the results obtained with various mixtures of sprinkling filter effluent. This table represents but a few results, selected at random from the large number obtained.

This table shows that appreciable differences may occur in the relative stabilities, if 1.00 cc. and 0.70 cc. of the methylene blue solution are used, yet the "Standard Methods" permit such variations. The variations

become more marked with the variation in the amount of coloring matter employed.

Many factors enter into the process of the formation of the leuko-base in the methylene blue putrescibility test. Therefore, it cannot be expected that this complicated reaction will always work out with mathematical precision. It is generally conceded that the reaction coincides fairly well with the disappearance of the nitrate- and nitrite-oxygen, but the following argument would suggest itself. If a certain sewage mixture shows a relative stability figure of 35 with 1.00 cc. of the coloring matter and only 26 with one half of this coloring matter, one or the other of these figures must be wrong. The elimination of the available oxygen must have been evidently retarded by the germicidal properties of the dye, as has been

TABLE III.

VARIATIONS IN RELATIVE STABILITY NUMBERS WITH CONCENTRATION OF METHYLENE BLUE.

Cc. m. bl. sol. per 150 cc. cap.	Relative Stabilities.														
	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.	K.	L.	M.	N.	O.
1.00	22	26	95	41	27	86	18	35	....	71	92	46	28	27	25
0.85	21	25	94	35	25	84	....	....	....	....	....	....	....	....	....
0.70	20	22	87	32	22	77	16	....	....	....	....	....	....	....	....
0.55	....	....	....	....	....	....	14	....	....	....	....	....	....	....	....
0.50	....	....	....	....	....	....	....	26	22	....	84	....	....	....	....
0.40	....	....	....	....	....	....	....	25	19	64	....	29	19	18	17
0.30	....	....	....	....	....	....	....	22	16	59	82	....	....	....	....

pointed out by Weldert, Spitta, Jackson and Horton. Now the question arises: How much of the methylene blue should we add to make the test indicate the elimination of the nitrate and nitrite oxygen and without influencing the time through any germicidal action of the dye.

For this purpose a series of tests was arranged in which the time of decolorization was recorded on one and the same sewage mixture, when different quantities of the coloring matter were employed. A series of bottles containing the same sewage mixture, without dye, however, were likewise incubated at 20°C. and the nitrates as well as nitrites determined in one of the "blank" bottles whenever the blue color disappeared in one of the putrescibility bottles. In this way it was deemed possible to come fairly close to the actual amount of dye indicating the elimination of the avail-

able oxygen. Table IV shows the results obtained. "Crsp. min. n." indicates the corresponding nitrate-nitrite oxygen in ppm. of nitrogen in the "blank" bottles.

TABLE IV.

VARIATION OF END POINTS IN NITROGEN WITH CONCENTRATION OF METHYLENE BLUE.

Cc. m. bl. sol. per 150 cc. cap.	A.		B.		C.		D.		E.	
	Rel. st.	Crsp. min. n.	Rel. st.	Crsp. min. n.	Rel. st.	Crsp. min. n.	Rel. st.	Crsp. min. n.	Rel. st.	Crsp. min. n.
1.00	22	1.00	26	0.16	95	0.06	27	0.08	18	0.06
0.85	21	0.07	25	0.10	94	0.07	25	0.08	16	0.05
0.70	20	0.08	22	0.10	87	0.01	22	0.17	16	0.06
0.55	.....	.....	.....	.....	.....	.....	.....	.....	14	0.06
1.00	.....	.....	71	0.05	.....	.....	.....	.....	.....	.....
0.85	20	0.05	.....	.....	.....	.....	.....	.....	.....	.....
0.70	18	0.06	.....	.....	.....	.....	.....	.....	.....	.....
0.50	16	0.05	.....	.....	25	0.11	.....	.....	.....	.....
0.40	.....	.....	64	0.01	22	0.07	16	0.15	21	0.14
0.30	.....	.....	59	0.03	21	0.10	15	0.61	16	0.26
0.40	19	0.46	75	0.13	21	0.08	20	0.09	19	0.19
0.30	16	1.36	60	0.32	16	1.57	16	0.88	16	0.92
0.40	19	0.18	25	0.19	22	0.01	21	0.08	19	0.07
0.30	16	0.40	16	1.10	20	0.08	16	1.57	16	0.37

The initial mineral nitrogen (nitrate-nitrite-oxygen) varied as a rule from 1 to 5 ppm. I believe that the tabulated results point to the conclusion that if 0.4 cc. of the methylene blue solution is used the mineral nitrogen at the time of decolorization has practically disappeared. The shorter time required by the use of 0.3 cc. of the coloring matter does permit the retention of larger quantities of the nitrate-nitrite oxygen. It is also noteworthy that a certain small residual mineral nitrogen is left even if the time of exposure be extended beyond the time occupied by the decolorization of 1.00 cc. of the methylene blue. For all practical purposes such a small quantity is immaterial since the oxygen available from it is likewise extremely small. The small quantity retained might possibly be due to the limitation of the method employed for the determination of the nitrates (aluminum reduction method as given in the "Standard Meth-

ods of Water Analysis"). Strict precautions were taken to prevent the introduction of working errors, and "blank" tests were frequently made on the reagents.

To demonstrate still further the inhibiting effect upon the denitrifying bacteria, a series of experiments was arranged, using sewage-sprinkling filter effluent mixture in four bottles of 150 cc. capacity each. One contained 0.4 cc. of the methylene blue solution, the others 1.0 cc. each. The time of decolorization of the 0.4 cc. bottle was noted as closely as possible and the nitrates, as well as the nitrites, determined in one of the 1.0 cc. bottles at the same time. A "blank" test was made under the same conditions with 150 cc. of distilled water containing 1.00 cc. of the coloring matter. The nitrites were not determined separately but together with the nitrates and the sum expressed as "min. n." (mineral nitrogen) in Table V. Of the residual two putrescibility bottles containing 1.00 cc. of the methylene blue solution, one was examined for residual nitrate-nitrate after a certain time interval (figures in parenthesis in Table V), the same determination being made on the other at the time of decolorization. Table V shows the results obtained:

TABLE V.

	A.	B.	C.	D.	E.	F.	G.
Min. n. in ppm. at start	3.38	3.75	3.77	2.96	4.46	3.26	2.30
Time of decol. with 0.4 cc. m. bl. in hours	36	20	18	21	25	20	24
Min. n. in ppm. remaining in 0.4 cc. bottle	0.11	0.33	0.26	0.08	0.42	0.06	0.23
Min. n. in ppm. at the same time in 1.00 cc. bottle	0.57	2.14	1.08	1.12	2.43	2.15	1.27
Min. n. remaining in 1.00 cc. bottle after — hours	0.13 (47)	0.77 (27)	.....	.....	0.12 (32)	.....	0.48 (36)
Min. n. remaining in 1.00 cc. bottle at time of decolorization	..... (64)	.....	0.06 (24)	0.10 (34)	.....	0.12 (31)	0.11 (52)

A good many of the results were necessarily lost for the reason that the blue color went during the night. This constituted the main difficulty throughout and approximately three fourths of all the tests had to be discarded. Table V shows conclusively the retarding influence which 1.00 cc. of the methylene blue solution has upon nitrate reduction. When the mineral nitrogen was nearly gone in the 0.40 cc. bottle it was still persistent in considerable quantities in the 1.00 cc. methylene blue bottles.

All of these samples were incubated at 20° C., and beyond a few tests no detailed study has been made of the results obtainable with various quantities of the dye on incubation at blood temperature. The few tests which have been made, however, have convinced me that relatively the same discrepancies may result.

The use of 0.40 cc. of the 0.05 per cent. methylene blue solution in 150 cc. of the liquid to be examined is sufficient for the purpose of observing the decolorization clearly, unless adsorption takes place, in which case the decolorization of the precipitate must be watched.

It must be conceded that the observations recorded here hold good only for the brands of the dye employed by me. It is possible that other brands vary in their germicidal properties. In the light of my observations, this is a factor of great importance if the interpretations of the results obtained with this method are to be of service. Even in one and the same laboratory employing a definite concentration of methylene blue an appreciable mistake may be introduced by employing putrescibility bottles of varying capacity. I have often found one and the same factory lot of four-ounce bottles to vary between 110 and 137 cc. or 24 per cent. That such differences may give rise to differences in the result is clear. All of the "relative stability" figures obtained lately in the laboratory and field work of the Sanitary District of Chicago are based upon 20° C. incubation in 150 cc. bottles containing 0.40 cc. of a 0.05 per cent. aqueous methylene blue (Weiler-ter Meer Co.) solution.

In view of the importance of the test, I would recommend that the Committee of the American Public Health Association on Methods for the Chemical Analysis of Water and Sewage investigate the matter as presented in this paper. The concentrations of the methylene blue solution permitted by the "Standard Methods of Water Analysis" at present are undoubtedly too high. Only one definite concentration should be made "standard."

REPORT OF COMMITTEE ON INDUSTRIAL HYGIENE AND SANITATION IN THE HOME.

J. H. Landis, M. D.,
Chairman.

Read before the Section of Public Health Officials, American Public Health Association, Colorado Springs, September, 1913.

The Committee on Industrial Hygiene and Sanitation of the Home approached the subject with rather an indefinite and hazy idea of just what such a report should contain.

Feeling that a collection of state and municipal laws concerning the subject would be a wicked waste of time and effort and that information concerning them, when desired, can be obtained readily by correspondence, no attempt has been made to assemble them.

Each industry presents a sanitary problem differing slightly or radically from every other industrial sanitary problem, according to the nature of the work done.

Trades are often erroneously held responsible for diseases having their origin in conditions entirely outside the trade in question.

It is perfectly apparent that legislation directed to the trade itself would fall far short of achieving the desired result.

The workman, the employer, and the public are all vitally interested in maintaining the highest degree of good health in all of the trades. Inefficiency due to poor health reduces the workman's wages, cuts the profits of his employer, and imposes additional burdens on the taxpayer.

Arguments based on a knowledge of the bacterial causes of disease too frequently fall on deaf ears. People are very slow to believe what they cannot see. For this reason, arguments clothed in terms of dollars reach the workman, the employer and the taxpayer with equal force.

Three years ago, after a study of local conditions in Cincinnati, it occurred to me that in organized labor could be found an instrument for the dissemination of facts concerning industrial hygiene. Coöperation was solicited in a series of addresses given before central labor organizations. In the beginning the response was feeble, and the infant organization passed through the traditional hard second summer.

The primary object of the organization was to correct conditions in workshops and factories, which are recognized as contributing factors in the development of tuberculosis.

Other insanitary conditions inside and outside of workshops and factories, as well as those contributing to the tuberculosis problem, now engage

our attention, and we have succeeded in bringing about many improvements.

These improvements have been reported back to the unions and have served to arouse interest and enlist their hearty coöperation.

The feeble infant has developed into a husky youngster that, under the name of the Sanitarians of Organized Labor, meets the second and fourth Sunday of each month in the office of the health officer. New complaints are received, and reports on old complaints are furnished by the department. Complaints received on Sunday are investigated on Monday and, if found correct, orders are issued for their abatement.

Employers of labor have become interested in the work, and radical reforms in method and time of sweeping, ventilation, spitting on the floor, light, toilet facilities, common drinking cups, etc., have been brought about.

Reports of sick and death benefits are solicited and analyzed, and the heavy financial drain due to preventable causes explained to the men.

An epidemiological study of tuberculosis in shoe workers, covering a period of five years, revealed startling facts as to how and why the victims contracted the disease and how it can be avoided in the future. Arrangements are being perfected with all of the proprietors of shoe factories in the city for a meeting with the health officer. Detailed sanitary reports on each factory will be submitted, and we have the assurance of men in the business that all of our recommendations will be followed.

We are working for medical inspection of all employees and, while not yet successful in obtaining it, we have reason to believe that it will come in a short time. The objections against it are that it means taking infectious men who are still able to work from their jobs, and the payment of sick benefits to their families.

The employment of a visiting nurse has also been urged, but up to date nothing has been accomplished.

Wherever possible, departments of health should employ one or more trained men for the epidemiological study of tuberculosis and industrial hygiene. To the question that may be asked as to the results obtained, I can answer in the words of one of the delegates when he declared in open meeting that the organization had done more to improve sanitary conditions during its short existence than had all of the unions combined before.

After four years of public health work, it appears to me that the plan promises more in the way of actual accomplishment than any other one with which I am familiar.

Sanitation of the home involves so much knowledge of a technical nature, that I am appalled when I approach the subject.

People inherit their ideas concerning ventilation, baths, cooking, heating, dressing, sewage disposal, etc., very much as they do their political and religious affiliations.

The hope of the country is in the coming generation. Removing fallacious ideas about home sanitation, that have been handed down from the stone age, is very much like removing stumps from a recently cleared piece of forest and is a job requiring dynamite and giant stump pullers.

When a visiting school nurse comes back with the report that the mother of a verminous child has insisted that lice are healthy and that the skinny physical condition of the nurse is in all probability due to the fact that she has failed to avail herself of their tonic qualities, one gets a fleeting glance at the problem confronting the man who tries to make a dent in the understanding of the passing generation.

Too often our appeals are aimed at people who by reason of their age are sunk in habit and tradition's hopeless rut.

The place to teach home sanitation is in the school room. Proper sanitary living is as much a habit as is whiskey drinking or tobacco smoking.

The sanitary habit should be cultivated during the most impressionable period of life, and that period is during infancy and early adolescence. Every little red schoolhouse should be a school of sanitary instruction. Children have the idea that their school teacher is more than human—an exaggerated idea, perhaps, in some few isolated instances, but one that can be turned to good account in sowing the seeds of right living.

The text-books offer a splendid field for instruction, and the time is not far distant when those classics in school literature, "Ned, can you hop?" and "What is in the nest?" will give way to epigrammatic statements concerning the value of fresh air, the danger of the common drinking cup and the roller towel, the importance of a pure water supply, the relation between sewage and disease, the contributing influence of alcoholic indulgence in the development of tuberculosis, etc.

For centuries, courts have been busy in curtailing the powers of the state and widening what is popularly known as the personal liberty of the individual. One of the results is that dependency and delinquency are the sole inheritance in some families.

The old saying that a man's home is his castle should hold good only when by correct living he eliminates himself as a menace to his neighbors.

The safety of the mass is of greater importance than the personal liberty of the individual.

Habits of living which are followed by an army of diseased, delinquent and dependent people, endanger the public health of a community and increase the burden of taxation should be regulated with an iron hand.

We have laws compelling the presence of certain sanitary appliances in homes, but are all but helpless in attempting to regulate the habits of life of those living in those homes.

Self-preservation demands a radical revision of the definition of personal liberty in order that future generations shall not come into the world

chained to a corpse; it demands a radical change, giving the state the power to correct an environment that has left its wrecks through a series of generations and produced a stock that is constantly threatening to vitiate what, in comparison, is pure blood.

Sanitation of the home is the unit which determines the general level of the sanitation of the state.

Power to regulate water supply and sewage disposal or to vacate or destroy property unfit for habitation helps materially in improving the sanitation of the home, but it fails to reach that class of people whose personal habits render any home unfit for occupancy.

One of the great difficulties in bringing about improved sanitary conditions in the home is due to the fact that too much has been left to volunteer social workers. The maximum of benefit can only be achieved when trained sanitarians are employed by departments having behind them the full power of the state. Untrained social workers too often confuse cause and effect. It is perfectly obvious that efforts directed at end results are worse than wasted and that a suggestion from an unofficial source lacks the force of a peremptory order from an official one.

To be of the greatest benefit, the workers should be physicians and graduate nurses. The sanitary engineer's training is not sufficiently broad to qualify him for this work.

To bring about the best results in sanitation of the home, it appears that three things are necessary:

I. Teaching hygiene and sanitation in the schools throughout the entire school age.

II. The employment of trained sanitarians on full time, who are officially a part of the health department.

III. More power to enter private homes for the purpose of correcting conditions which not only endanger the moral and physical welfare of the present generation but actually place a mortgage on future generations.

September 4, 1913.

REPORT OF THE COMMITTEE ON THE STUDY AND PREVENTION OF COMMUNICABLE DISEASES.

Read before the Section of Public Health Officials, American Public Health Association, Colorado Springs, September, 1913.

No great advances in methods of control of communicable diseases have been made during the year.

The new isolation hospital, which is building at Jacksonville at which the principles of aseptic nursing are to be carried out, marks another step toward the acceptance of the theory of the transmission of infection by contact rather than by means of fomites; a theory which your committee strongly advocated in its report in 1911.

Evidence is accumulating that infection in scarlet fever is not transmitted by the scales of desquamation and more atttention is being paid to the buccal and nasal discharges as the means of transmitting infection.

No more work has been done in regard to prophylaxis in this disease by means of autogenous vaccines, a procedure which gave promise of a certain amount of value at the time of the last report.

There is still great divergence of opinion among health officers as to the length of time that a patient should be held in isolation in scarlet fever, and the measures to be taken before his release, although there seems to be a growing tendency to relax the restraint imposed upon the well adult members of the family.

In typhoid fever there can no longer be any question in regard to the protective value of anti-typhoid inoculation, and the chief interest now centers in the duration of the protection afforded by it.

While there is some evidence that the immunity, as shown by a positive Widal reaction, seems to persist as long as four or five years after the protective inoculation, the weight of evidence seems to show that three years is as long as it is safe to count upon immunity.

It has seemed to your committee that the question of carriers in communicable disease is one of great importance at the present time, and also one the proper solution of which presents great difficulties.

The carrier has been demonstrated in diphtheria, typhoid fever, cholera, cerebro-spinal meningitis, etc., and it is fair to suppose that it exists in many others where it has not as yet been demonstrated.

Thus, in scarlet fever, many cases which seem inexplicable by ordinary methods, can easily be explained if we accept the theory of a carrier.

Cases which have been released from isolation, apparently absolutely

free from disease, may leave a trail of cases which can be explained in no other way.

There is great diversity of opinion in regard to the proper manner of dealing with carriers, and also a number of practical points to be solved.

A man who has a frank, undoubted case of communicable disease is comparatively easy to deal with, and if he fails or refuses to follow out the orders of the board of health can be punished, but it is far different with a carrier.

It is sometimes very hard to convince a man, who feels perfectly well, that he should have his liberty restrained because he is or may be a menace to others, and it is also hard to convince a court that the orders of a board of health are necessary and reasonable when we try to enforce them against a carrier.

If it can be shown that the case is directly responsible for other cases the task may be easier, but it is not always possible to do this.

Your committee has attempted to collect and present some facts in regard to diphtheria carriers in the hope that some method of control in such cases could be formulated.

There is a large number of observations in regard to diphtheria carriers and the percentage of well persons found who show positive cultures varies greatly; depending in great measure upon how recently the subjects have been exposed to possible contact, upon the prevalence of diphtheria in the community, upon how carefully the observations have been made and many other factors.

The percentage of virulent cases among carriers differs widely also, and apparently observations in regard to this phase of the question have not been so carefully worked out.

There can be no doubt that the diphtheria carrier can be held responsible for a certain number of cases of clinical diphtheria and that he is a very real menace.

Like the typhoid carrier, the diphtheria carrier may be intermittent, showing a positive culture at times, followed by periods when the cultures are negative.

In 1902 the committee on diphtheria bacilli in well persons, appointed by the Massachusetts Association of Boards of Health, reported that out of 3,096 persons examined, 1.39 per cent. showed a positive culture. This number included only those persons who had not been recently exposed to diphtheria infection, as far as known, and only those whom the committee considered to have typical diphtheria bacilli, viz., "A" "C" or "D" of Wesbrook's types, in the throat or nose or both, were classed as positive.

In addition to the above 1,154 other persons were cultured, many of whom had been recently exposed to infection or were residents of localities or institutions where diphtheria has been recently present. If these persons

are included the percentage of persons infected would be raised to 2.89 per cent.

In order to discover as far as possible what is the present practice in regard to diphtheria carriers and also the methods in vogue in regard to clinical cases, your committee drew upon a *questionnaire* covering these points. Copies of this *questionnaire* were sent to cities in every country represented in the American Public Health Association.

In all 189 copies were sent to cities of every class recognized by the United States Census Bureau and to corresponding cities in Canada, Mexico and Cuba. Eighty-three replies were received, showing a great variation in the methods of dealing with cases of diphtheria and possible carriers.

Four cities that replied have no rules governing the control of communicable diseases and leave the whole matter to the attending physician.

Of those cities which have rules, sixty-eight require cultures to be taken to determine the end of isolation in diphtheria, while eleven have no such requirement, but do have a fixed minimum period of quarantine.

In two of these cities, if it is desired to terminate the isolation before the end of the fixed period, cultures may be taken, and the patient released on a negative result.

Fifty cities take release cultures from the patient alone, and eighteen take them from all the members of the family.

Thirty-eight require the release cultures from both nose and throat, and thirty from the throat alone, except in nasal cases.

There is slightly less variation in the number of negative cultures required for release, forty-nine requiring two successive negatives at least twenty-four hours apart, while nineteen are contented with one only.

The treatment of the well members of the family varies widely, and varies also with the occupation.

Twenty-eight cities say that all the well members of the family are segregated, although it appears that this rule is somewhat relaxed in some places if they leave the house and live elsewhere, and show a negative culture.

The other fifty-one cities allow a certain amount of freedom to the well members, depending somewhat upon the occupation.

Thus, physicians are allowed to pursue their usual vocation in forty-seven cities, clergymen in thirty, teachers in ten only, other professional men, in thirty-seven.

Handlers of milk and food are absolutely prohibited from continuing their work in all but six cities, and in those they must leave the house.

Salespeople may work in thirty-two cities, mechanics in thirty-seven and laborers in forty, while in all the replying cities, school children are excluded from school during the continuance of the disease, if they remain at home.

Of the fifty-one which allow the other members of the family to continue their work, twenty-three require preliminary negative cultures. Apparently in these cases the cultures must be taken from both nose and throat, twenty cities requiring one negative culture from each, while three require two.

Where more than one family occupies the house, twelve cities require a negative culture before allowing persons other than those in the family to go out, while the others impose no restraint.

Not all of the cities replying answered the questions in regard to the management of school children, leaving it to be inferred that the board of health does not control school inspection.

Thus, sixty-five only replied to the question, "Do the school inspectors take cultures from all sore throats no matter how mild?" Thirty-one replying affirmatively, thirty-one negatively and three replying "sometimes."

In case of an outbreak, forty-five culture all the children in the room, sixteen do not and in four it depends upon conditions.

Seven make periodic examinations of school children to detect carriers, while fifty-eight do not.

The measures taken to control carriers vary very widely, fifty-six of the replying cities treating a carrier practically as a case of clinical diphtheria, by placarding the house, etc., although some make the placard read "Diphtheria Carrier" instead of "Diphtheria."

Of the other replying cities, three make virulence tests, releasing the non-virulent cases, while the remainder do practically nothing.

Only two cities attempt to make a distinction between a carrier who has recently had the disease and one who has not.

When a carrier has been found sixty cities advise the use of the usual anti-diphtherietic treatment, such as the administration of antitoxin, using antiseptic sprays, etc., to hasten the cure of carriers, while five advise the use of the staphylococcus spray.

This latter method seems to be growing in popularity and apparently has the effect of shortening the period of positive cultures, although, in looking over the published reports of treatment by this method, it appears to be not entirely free from objection.

From this hasty summary of replies, it is very evident that, even in a disease as fully studied as diphtheria, there is a great lack of agreement as to methods of control of clinical cases, and that the question of the control of carriers is even more confused.

A number of suggestions as to methods of control of carriers were made especially among school children, but none of them appear to be practical. Thus it would be impracticable to take periodic cultures of all school children for such a purpose, or even to make a daily routine examination

of the throats of all children in the schools, culturing such as appear suspicious.

Your committee believes that a distinction should be made between carriers who have recently been exposed to diphtheria and those who have not.

In the report of the committee on diphtheria bacilli in well persons, already referred to, the following conclusions were reached: first, "It is not practicable to isolate well persons infected with diphtheria bacilli, if such persons have not, so far as known, been recently exposed to the disease, and, second, "It is not advisable as a matter of routine to isolate from the public all the well persons in infected families, schools and institutions."

Your committee can see no reason for offering at the present time any conclusion differing from these, and would request more time in order to make a further study of the best methods of controlling persons who have been recently exposed to infection.

Francis George Curtis, *Chairman*,
Julio F. Arteaga,
Charles V. Chapin,
S. D. Rawlings.

BOOK REVIEWS.

Nerves. *By David F. Harris. (No. 74 in The Home University Library of Modern Knowledge.) Henry Holt & Co., New York. 256 pp., 50 cents.*

This book is thoughtfully conceived and contains a somewhat unusual selection of material. It aims to indicate the functions of the nervous system with no more anatomical description than is absolutely required and with an appropriate emphasis upon matters of hygiene. The plan is carried out with considerable success. The author writes with a certain freshness of exposition and a ready employment of analogy which result happily in a presentation which is always clear and attractive. In the main the teachings concerning the ordering of life with a view to nerve conservation can be endorsed.

There is a dogmatic tone in some of the chapters to which objection may be made. It is true that the lay reader and the elementary student desire just this air of finality. But it is not wise to make so many positive assertions with respect to questions which cannot be regarded as settled. The writer on popular science should improve his opportunity to teach suspension of judgment in default of evidence. This is a lesson not often learned. In the present instance it seems particularly undesirable to treat the nervous system as a conductor of hypothetical fluid instead of a transmitter of energy. The name "neurin" which already has a fixed chemical meaning should not be adopted for this new use.

Percy G. Stiles.

The Medical and Sanitary Inspection of Schools. *By S. W. Newmayer, A. B., M. D., in charge of the Division of Child Hygiene, Bureau of Health, Philadelphia. 12mo, 318 pages, with 71 engravings, and 14 full page plates. Cloth, $2.50, net. Lea & Febiger, Publishers. Philadelphia and New York, 1913.*

In this volume, Dr. Newmayer has presented a book which should be read by every school physician, for there is hardly a question which is likely to confront him in his daily work to which he cannot find a solution.

This book consists of an introductory chapter, containing a sketch of the history of medical school inspection together with its object, and four parts, dealing with different branches of the work.

Part I takes up the administration, giving the details of managing a well-equipped division, including the duties of the school inspector, the school nurse, methods of inspection and record keeping.

The subjects are so treated that any city establishing a system of school inspection can find all the necessary details of the work, even to specimen forms of blanks, and the head of a division already established will find much of value in this part.

It is perhaps to be regretted the author does not lay more stress upon the advisability of placing the control of school inspection in the hands of boards of health rather than in those of boards of education, for while it is freely admitted that the detection and exclusion of cases of communicable disease is a very small part of medical inspection, yet it is a part and at times a very important part, and it is one which the board of health must necessarily handle. If, therefore, the school inspectors are under the direction of the board of health, they are in a better position to cope with outbreaks of communicable disease, and are certainly no less competent to deal with other physical defects than inspectors appointed by a board of education.

Part II deals with the school buildings and grounds, a part of the work too often neglected or overlooked, but as the author truly says, "One cannot teach hygiene and healthful living surrounded by unsanitary buildings in which to conduct classes."

This part contains descriptions and plans of model school buildings and class-room equipment, all of which will be read with great

interest and profit by the school inspector. The section on ventilation and heating is worthy of careful reading.

The part ends with a short section upon cold rooms and open air schools, methods of improving the health of school children in which many cities are deficient, there being only fifty-five cities in the United States having such schools.

Part III treats of infectious, contagious and communicable diseases. It seems a pity that in dealing with this branch of his subject the author should fall a little below the level of the rest of the book, but certainly some of the methods of procedure advised are open to question.

In speaking of the various methods by which infection is transmitted, transmission through the air is included; surely the experience in various barrier hospitals has discredited this method of transmission.

The author directs that a class-room in which a case of scarlet fever, diphtheria or smallpox has been found should be closed and disinfected. One is tempted to wonder how much infection would be found in a room in which a child with one of these diseases had been present for a few hours, or how many health departments, when they do disinfection with formaldehyde, are careful that the amount of moisture in the air of the room is over sixty per cent. or that the temperature is over 65° F.

As it is stated that a failure to observe either of these precautions will cause the disinfection to be a failure, it would be more effective to have the patient's desk and the floor around it carefully scrubbed.

Again the period of exclusion of contacts seems to be unnecessarily long, in view of the fact that modern practice seems to tend toward lessening the quarantine restrictions upon the well members of the family and relying more upon careful isolation of the sick and inspection of contacts, as a method of controlling disease in the schools.

Following these general methods of procedure come short descriptions of the various diseases giving the more marked signs to be looked for in each.

This part is illustrated with numerous illustrations, some of them colored, which add much to its value.

Part IV treats of the various non-communicable ailments and defects which legitimately come under the supervision of the school inspector with more or less detailed descriptions of the procedure to be followed in each.

Methods of testing sight and hearing are given together with warnings in regard to avoiding certain pitfalls, and much attention is given to dental defects and their treatment.

Then follows a consideration of orthopedic defects and certain systemic ailments as malnutrition, and anæmia. The question of school lunches is considered and the author very wisely discourages their establishment, if intended as a relief for improper nourishment of the poor, holding that this is no part of the school function.

It is to be regretted that the author does not go more into detail in the question of teaching sex hygiene. On the whole he approves of teaching it, especially in the higher grades, but warns against exciting curiosity in the younger children. To quote from the author "Knowledge of a subject does not take the place of moral stamina." In these days when so many ill advised but well meaning persons are clamoring to have the schools teach sex hygiene, with no thought of the fitness of those who may be called upon to give the instruction, it is well to remember that sentence.

The book is well printed, easy to handle and of a convenient size, its many cuts adding much to its value.

Francis George Curtis.

The Medical Inspection of Girls in Secondary Schools. *By Catherine Chisholm, B.A., M.D., medical inspector to the Manchester High School for Girls. 208 pages with diagrams. $1.10 net. Longmans, Green. New York. 191½.*

Dr. C. Chisholm displays a clear conception of the educational function of school medical inspection. The social position of girls in secondary (high) schools is such that they exert an important influence on the community in which they live. They are the teachers, the educators of the future, the social workers, the nurses and women doctors, the

wives of the professional, business and legislating classes of their generation.

The attitude of such women to the question of public and private hygiene is of very great importance to the community. It is important also that girls from these schools shall be turned into the world mentally and physically fit. The tendency of eager, ambitious students is, often by early over-pressure, to undermine health. Perhaps this is found especially in girls' schools. They have fewer opportunities for distraction than their brothers. The care of bodily development during the years when girls are discerning and testing their capacity, when they are subject to strain of growth and effort is of the highest importance.

She truly takes it for granted that in a girls' school the most suitable medical inspector will be a woman. Viewing the matter without prejudice, it is evident that girls will find it easier to submit to medical examination if the examiner is a woman; and this opens a sphere of activity for women physicians all over the world.

The medical inspector, whose interest is in the school as well as the individual girls, must be one who can visit the class-rooms and discuss school problems with the teachers without reserve, and in a girls' school this is best accomplished by a woman physician. Her duties also include the supervision of remedial work in the gymnasium and the instruction of teachers, pupils, and parents in the hygiene of school life.

The book is complete in all essentials of instruction and advice, covers the general field of school medical inspection admirably, and readily takes its place among the best of recent works on this important subject.

W. W. Roach.

HEALTH DEPARTMENT REPORTS AND NOTES.

REPORTS.

Reading, Pennsylvania.

Considering the amount of money expended on health work, the city of Reading is fortunate in having such good sanitary conditions as are shown in the report of the Board of Health for the year 1912. Less than fourteen cents per capita is expended on health work each year and of this amount Dr. Becker, president of the board, says: "The greater proportion of our appropriation is used for paving and repaving of private alleys, and the cost of which is assessed on the abutting property owners, who pay it back into the treasury, and when paid promptly, we can again use it, but eventually it goes into the treasury at the end of the fiscal year."

It is, perhaps, a good plan for the Board of Health to act in advisory capacity on the paving of alleys but that it should be obliged to advance the cost out of an already inadequate allowance is ridiculous.

The effect of such false economy is shown by the fact that an assistant plumbing inspector, capable of handling the necessary work, cannot be hired for $780, the salary offered. The chief plumbing inspector receives $1,000 per year but the health commissioner receives only $880. Less than $75 a month! Other necessities which cannot be obtained under the present arrangement are more roomy quarters for the office and laboratory, the employment of visiting nurses and child welfare nurses, a municipal hospital, public comfort stations and reorganization which will allow the health commissioner to carry on some work other than quarantine and fumigation which now occupies the greater part of his time.

The report on vital statistics shows a death-rate of 13.22. The birth-rate is reported as 24.05, but of the 2,393 births used in obtaining this figure, 192 were either premature or still. The infant mortality, based on the corrected number of births is 89 per thousand births. The alphabetical classification of deaths, so common in Pennsylvania, is open to the usual criticisms.

They report of the milk and meat inspector is one of the bright spots in the book and shows that much improvement has been brought about by active work especially along the line of education of the producers, and by following up with prosecutions when necessary.

Rochester, New York.

Dr. George W. Goler, health officer, submits a very good report of the work of the Health Bureau of the city of Rochester during the year 1912. Rochester has a population estimated at 225,000; a death-rate of 14.43 per thousand; birth-rate of 24.57 (probably incomplete among the foreign population); and an infant mortality rate of 75.6 per thousand births. All of these rates are good and are an improvement on the average of preceding years.

The report covers forty-eight pages and is largely statistical so that a great deal is covered for the amount of space used. The tables of statistics are unusually complete and are in general well chosen. The present tendency of health reports, however, seems rather to be toward a form which will be easily read and attractive and instructive to the common citizen rather than a mere statistical résumé which is of interest only as a reference work. It is unfortunate that among tables which are in general so up-to-date the international classification of causes of death should be displaced by an alphabetical classification.

The expenditures of the Bureau of Health, not including garbage disposal or the maintenance of the municipal hospital, amount to about thirty-three cents per capita per

annum. The milk supply is reported as unsatisfactory but improving. A Lorenz Milk Tester is being used and has been of great value in demonstrating to producers, as well as consumers, the amount of dirt present in the samples from various sources. The water supply of the city is of good sanitary quality but has given trouble during the year on account of various algae and protozoa. One of the most interesting sections of the report is that on the child welfare work which is being carried on. Medical inspection of schools, school nursing, and chemical and bacteriological laboratories are maintained but are only reported statistically.

Springfield, Illinois.

It is refreshing to be able to review a health department report for 1913 thus early in the year. The report of the Department of Health of Springfield, Ill., was received early in February, less than a month after the receipt of many 1912 reports. Aside from its promptness the Springfield report has not much of which it can boast. A few cities as large as Springfield (estimated population, 56,476) publish no health department report, but a seven page report from the capital city of Illinois is not a very creditable showing.

The department, however, is aware of its own deficiencies and does not hesitate to point them out and make recommendations for their remedy. When a city buys only seventeen cents' worth of health per capita it cannot complain about the small quantity it gets. Nor are conditions as bad as might be expected. The death-rate for 1913 is 17.6 per thousand, and this is the highest in six years. The death-rates from tuberculosis, diphtheria and typhoid show a decrease from the 1912 figure. The death-rate of children under one year per 1,000 births appears to be 127 but it is estimated that if all births were reported the rate would be reduced to 84.

Among the improvements recommended for the coming year are an ordinance which will enforce connection of new buildings with water and sewer where possible; the establishment of a certified milk commission, the establishment of infant milk depots, and the introduction of medical examination of school children.

The report is a good one but should be more extensive. The tables of statistics are well chosen but incomplete. Although money may be more immediately effective when expended for actual sanitary work; it is possible that a more complete (and expensive) report might lead to a larger appropriation and thus prove to be a good investment.

DEPARTMENT NOTES

The Health Officer and Leadership.

"Leadership is the best asset of a health officer, teacher, governor or statesman. When General Grant took command of the armies of the Union, the Washington board of strategy went out of business. To be a leader in sanitation is just as important in its line, as to be a Grant; in fact, all successful health officers possess the Grant faculty of leadership. Our health officers need to have faith in their powers. Not to have faith in their powers hobbles them. The man who inhibits his natural powers is dominated by negative ideas. The mind grows by what it feeds upon. If it feeds upon fear and failure it will reap them. The thing to do is to go ahead and try. One learns by failure as well as by success. The health officer who tries and fails is worth a thousand never-tries and in nine cases out of ten wins. The successful sanitary leader is he who is not turned aside by fear of failure or a few real failures, and soon numbers his followers by a majority of his community."

Public Health (Michigan State Board of Health), December, 1913.

Quarantine for Measles.

It is often claimed that there is no virtue in quarantining cases of measles since the contagious stage has existed and may have passed before diagnosis can be made. In the *Medical Officer* of January 3 an argument is put forward that the indirect effect of quarantine may be sufficiently valuable to make it worth while.

"While pointing out that the compulsory notification of measles with a view to preventing the spread of the disease is generally held to be of doubtful value, Dr. J. C. Bridge has advised the Breconshire county council that if such compulsory notification merely impressed upon the parents the highly infectious nature of this disease and the danger of it to young children, the expense incurred would be fully justified. He writes:

" 'The exclusion of children from school and the closure of schools is the only means at the present time of preventing the spread of the disease, but to what extent such measures operate for good it is difficult to see. Undoubtedly contacts and children suffering from measles are allowed to attend Sunday schools and places of amusement without let or hindrance, and for this reason I would strongly advocate making the disease notifiable.' Dr. Bridge adds that where children are exposed by their parents while in an infectious condition, he would also strongly recommend prosecution."

Public Baths in Los Angeles.

The following clipping from the *Monthly Bulletin* of the Los Angeles Health Society (December, 1913) shows how the latest ideas in public health work are being taken up in the West before the bad conditions which now exist in some of the eastern metropoles have reached them also.

"Liverpool was the first city to establish municipal bath houses. Her example was quickly followed by other English cities, and all but seven with a population of more than 50,000 inhabitants have a system of bath houses and many of the smaller cities possess public baths.

"European cities are far in advance of American cities in the provision of bathing facilities. Germany and Japan have most wisely provided for municipal bath houses.

"In 1895 the state of New York passed a law providing that all cities having 50,000 population or more shall establish and maintain free public baths. Buffalo erected two absolutely free bath houses and during the calendar years 1897–1900 a total of 323,942 baths were taken.

"There is a crying need for free baths in Los Angeles. We have a population of 500,000 people and a large percentage of our population have no bathing facilities. The percentage of transients is as great or greater than any other city of its size, and there are no places where a poor man can get a free bath or where, if able to pay a small sum for soap, towel, etc., they may take a warm bath. The benefits to the public cannot be over-estimated when we consider that clean bodies and surroundings insure health, earning capacity and better morals.

"We know the demand on the city for many public utilities has barred the establishment of comfort stations and public baths, but we do not want to defer this necessity in our excited rush for wealth until nature calls a halt to our progress."

Anti-Smallpox Measures in Toledo.

The *Weekly Report* of the Cincinnati Board of Health, for the week ending January 17, tells of the epidemic of smallpox in Toledo and of the steps which have been taken against it as follows:

"With over two hundred cases of smallpox reported in Toledo since December first, with drastic action threatened by neighboring cities, the State Board of Health and the Federal Government, that city at last placed in operation the machinery supplied by the state law for the suppression of epidemics.

"The following orders of the Toledo Board of Health became effective January 19:

"'No person shall be allowed to attend any institution of learning in the city of Toledo without first presenting a certificate of vaccination from a duly registered physician, which certificate shall state that said person has been successfully vaccinated within the preceding five years.

"'All employees of labor shall be notified that the Board of Health expects them to have all employees vaccinated, and notice is hereby given that in case of smallpox developing in any place of employment the Board of Health will put such place under quarantine.'

"The official statement of the Health Board regarding the small pox situation in Toledo follows:

" 'Of the more than two hundred cases discovered since December first, none of the patients had been vaccinated within five years. But one had ever been vaccinated and that had been done thirty years previously.'

"This is a remarkable bit of evidence as to the protective value of vaccination."

A Home-Made Test.

"Housewives who note a dirt sediment in the milk delivered to them in bottles can apply this test to the milk and present the pledget of cotton to their milkman as proof positive of a dirty, unsafe delivery. A simple method of applying this test to the milk is to use a perfectly clean funnel, inside of which a small piece of clean wire netting has been fitted at the neck opening, placing on this wire screen a thin layer of clean cotton. Stand the funnel in a large Mason jar and filter the milk through the cotton. Remove the pledget carefully and place on a clean white card to dry.

"If there is evidence of dirt on the cotton call attention of the milkman to it. If there is no improvement in subsequent deliveries, notify the Health Department."

Bulletin of the Chicago School of Sanitary Instruction, February 7, 1914.

The Telephone Transmitter and Disease.

The State Hygienic Laboratory of California has recently conducted some experiments with a view to determining the possibility of disease transmission by the mouthpiece of the telephone. In the *State Board Health Bulletin* for October the following results are given:

"Summary.

"People in using a telephone may infect the inner surface of the transmitter with particles of saliva, but the three mouthpieces tested showed a majority of organisms growing better at room temperature than at body temperature.

"Public telephone mouthpieces are often wet with condensed moisture from the breath, and then the only possibility of the transmission of disease is by direct contact. When the mouthpiece is dry the infectious dirt does not appear to become free dust and it is practically impossible for germs on transmitters to be blown back on to the mouth during a telephone call.

"Mouthpieces in busy call offices soon become gummy and unsanitary in appearance unless regularly cleaned, and, therefore, public telephone mouthpieces should be wiped off daily with a clean damp cloth.

"Diphtheria bacilli were not found on the ten public telephone mouthpieces examined, and the work of Bissell, Klein, and Spitta shows that it is practically impossible to contract diphtheria or tuberculosis from public telephone mouthpieces.

"Even in occasional cases of direct contact the public telephone mouthpiece cannot be compared to the public drinking cup.

"Conclusions.

"1. The danger of infection from public telephones is probably over-estimated.

"2. Mouthpieces in frequent use become unsightly if not cleaned at short intervals.

"3. From our own observations and the previous work of others we have formulated the following observations regarding 'sanitary' devices for attachment to telephone transmitters: 'Antiseptic' transmitters of the type investigated in the State Hygienic Laboratory in 1909 are entirely without value. Mechanical devices which protect and conceal the mouthpiece with fresh paper may have considerable value from the æsthetic standpoint and may possible prevent a few infections from contact between the lips and the transmitter."

Public Laundries in America.

In an excellently written article in the December number of the *American City* Dr. D. B. Armstrong, superintendent of

the Bureau of Public Health and Hygiene of the New York Association for Improving the Condition of the Poor, tells of the need of public laundries in the large cities of the United States, and especially in New York. Doctor Armstrong introduces his subject as follows:

"'Public Health is purchasable'; so, indeed, is public cleanliness. As a matter of fact, it is obvious that, when we begin to spend money for public health, we can have no certainty of obtaining it unless we have entered the market for cleanliness. In general, cleanliness is a prerequisite for health. If the state or the community recognizes a responsibility in the form of maintaining health, it is quite logical, then, for it to recognize the obligation which lies upon it to make provision for public decency. Many communities provide the means for the cleansing of human bodies. It is just as essential to health and *decency* that public facilities, where private ones are lacking, should be provided for the cleansing of the garments, the condition of which must, otherwise, lower the tone of decency of the people in the community. I emphasize *decency*, for it is essential that health workers should realize more and more that it is impossible to justify most of our expenditures if we consider these expenditures to be inducive of health *alone*. It is very difficult to definitely ascribe ill-health to dirty streets, unsightly back yards, and such undesirable elements in our physical environment for the elimination of which we spend thousands yearly, not in reality to maintain public health, but, as a matter of fact, to establish public decency."

The article continues to discuss the history of the public wash house or laundry in this country and abroad where it was first tried and to tell of the organization, and methods of operation. Baltimore has the best public wash houses in this country and now operates five which have met with success and appreciation. There and in Philadelphia special days are set aside for men. The plan is supposed to improve housing conditions and cleanliness and consequently health, but in addition Doctor Armstrong says:

"The public wash house, like the public bath, finds its chief justification in the fact that it gives to the people an opportunity to learn how to be clean and makes it possible for them to appreciate the value to health and decency in being physically clean. Physical cleanliness enhances their moral and spiritual tone. They will recognize more acutely their housing defects and will demand even more energetically than at present that equipment for the home which they have learned to use and value outside and the importance of which, for the preservation of health and the maintenance of decency, they have been educated to appreciate."

Diphtheria Carriers.

The *Journal of the American Medical Association*, in the issue of November 15, briefly abstracts an article from Pediatria (St. Petersburg) as follows:

"Lunin found that in 708 cases of diphtheria only 1.1 per cent. gave rise to 'return cases.' The patients were discharged after three bacteriologic examinations of the mucus from the throat and nose had given negative results. He also found that the bacilli that occur in healthy people, or remain unusually long in those who have had an attack of diphtheria, are not virulent, and are thus harmless. They may accordingly be sent home or left among other patients; the only precaution he recommends is to gargle the throat and clean the teeth."

Buying Health in Chicago.

The following clipping from the *Engineering Record* tells of the cost of Chicago's health activities of December 20, 1913:

"That the preventable deaths in Chicago are equal to the *Titanic* death list every month is an appalling fact at which few appear appalled, according to Dr. George B. Young, the health commissioner, who makes an appeal to citizens to help the department obtain funds with which to reduce the increasing number of such deaths. That public health is purchasable—within certain limitations—and that a community can determine its own death-rate have been demonstrated thoroughly, not only at Panama,

but in large cities. Chicago has fallen behind in healthfulness and, Doctor Young states, is paying the price in losing the commercial advantage of being the healthiest large city in the world. The doctor is right in urging Chicago's budget makers to wake up and take steps to regain its lost prestige—a prestige which he declares counts far more heavily in a commercial sense than many thinking men realize. The department is asking for 16 cents per capita more than last year, bringing the rate up to 47 cents per inhabitant. Based on the last Census Bureau reports, if Chicago invested in health to the same extent that Boston, New York, Newark and Washington did, its appropriations would be $1,460,000, $1,340,000, $1,316,000 and $1,005,000 respectively, whereas it spent last year only $723,000. In 1913 the health department cost Chicago 30.8 cents per capita; police, $2.86, and fire fighting, $1.43. The disparity is too great. The statistics indicate that the general awakening ten years ago to the increasing usefulness and possibilities of a properly equipped and financed health department in Chicago has not persisted. Ten of the largest cities in this country spend from 12.5 to 153.1 per cent. more than Chicago does. May Doctor Young succeed in persuading the finance committee of the city council that the department's past allowances, when compared to other cities where preventable death-rates are decreasing, have been too low."

Typhoid Epidemic in Washington.

"Eleven deaths and 297 cases of typhoid in Centralia, Wash., as the new year began, indicated the seriousness of what Dr. Calvin S. White, secretary of the Oregon State Board of Health, termed the worst epidemic of the fever that ever infested the Pacific Northwest. Doctor White was instructed to visit the site because of similar insanitary conditions in Oregon.

"According to Doctor White's published statement, all except six of the fever victims got their water from a shallow well on the edge of the Skookumchuck River, which constitutes the city supply. There was manifest contamination from the Mendoto coal mines and the city of Tono and from many cesspools just above Centralia. Chehalis, only four miles way, is in danger, as its supply is nearly as bad.

"Hypochlorite of lime is being used as a temporary water sterilizer. Nearly 400,000 people have been vaccinated by the state authorities."

Engineering Record, January 10.

County Health Officers.

The movement for full-time county health officers is getting a foothold in the South more rapidly than in the North and West. The Sate Board of Health of North Carolina is trying hard to get every county in the state into line and the idea is spreading to other states. The following from an editorial in the *Southern Medical Journal*, journal of the Southern Medical Association:

"Alabama is to be congratulated on having a county whose board of supervisors is wide-awake and up-to-date, and willing to listen to the advice of its physicians. The Walker County Board has appropriated $2,500 a year to pay the salary of their county health officer, and $500 for his traveling expenses. He is expected to devote all of his time and effort to the duties of his position, and if he performs those duties in an active and intelligent manner he will find little opportunity for anything else. It will be a fortunate day for Alabama when every county within her boundaries shall have realized that human life and human health are her most precious possessions, and that no other money spent by its public officials is more wisely expended than that which guards and preserves them. Every jail, courthouse, schoolhouse, showroom, bakery, grocery, butcher shop, aye, even the churches, at times need the supervision of such an officer. His authority will be magnified an hundredfold in the estimation of people generally when they learn that his services are valuable and actually worth paying for. Every county in every southern state needs an alltime health officer as a business proposition, partly because, like similar communities in all the United States, it needs their services, and also because an erroneous impression prevails in some other

parts of the country that we have more sources of disease than they; and a vigorous, active health officer reassures them of protection against all possible sources of disease. We want them to come and establish their homes and their pursuits side by side with our own, and the assurances of competent supervision of all matters pertaining to the public health is a strong argument in our favor. Walker County, though one of the richest in soils, timber and minerals in Alabama, has not generally been as highly appreciated for public enterprise as it has deserved, but this step has at one bound established it as a leader in the forward march of development. What other county will be first to follow?"

Improving Rural Health.

In the present rapid spread of the public health movement the dwellers in the country or in small towns and cities are too often forgotten. The increased number of full-time county health officers is a step in the right direction but a very short one. The coöperative board of health system which is proving so successful at Wellesley, Mass., and the surrounding towns could not be applied in the more thinly settled districts of the West. The *State Charities Aid Association News* (N. Y.) of January contains an article on the views of Doctor Biggs, the new state health commissioner, on this subject. We quote as follows:

"Dr. Biggs pointed out that in the country each dwelling house is a unit, just as the city is a unit. Each dweller in the country must provide for himself, water supply and sewage disposal, which the city provides for its residents. Through their health departments residents of the city are afforded health protection in both these particulars, among others, by the application of the results of scientific investigation. Such protection is not now given to rural dwellers, but the farmer has as much right as the city resident to the best health protection that modern science affords.

"By extending to the country, through a division of rural hygiene, the health advantages so long enjoyed by the cities, Doctor Biggs believes that the death-rate and the sickness rate in the country can be very much decreased and the efficiency of the community proportionately improved.

"In discussing the need for a division of rural hygiene in the State Department of Health, Doctor Biggs said:

"'Up to this time the rural districts, not only in this state but through the country, have received scarcely any attention from sanitary authorities. As a result we find that sanitary conditions there are scarcely different from those which existed in comparatively early times.

"'The great cities, notwithstanding their density of population and large percentage of foreigners ignorant of our laws and language, have entirely outstripped the country districts. Not only is the death-rate in the country relatively higher than that in the cities, but the birth-rate is lower.

"'New York City's death-rate is materially lower than that of the rural districts of the state. Through a long series of years the death-rate of the metropolis has been slowly but steadily declining until last year it was 137 out of each thousand of the population. On the contrary, in the rural districts, not only has the death-rate not declined but it has slowly increased.'"

Publicity in Prosecutions.

Believing that full publicity in connection with criminal prosecutions for violation of the Sanitary Code is one of the best means to secure compliance with its regulations the Department of Health of New York City will, in the future, publish in its weekly bulletin a summary of the cases decided during the week. The statement will be divided into two parts; one showing the prosecutions in the Court of Special Sessions and giving names, addresses, character of violation and sentence; the other merely showing the totals of the cases tried in the Magistrates' Courts without giving details since such cases are only of minor violations.

Feline Diphtheria.

The *Journal of the Royal Sanitary Institute* in its February issue abstracts a portion of the discussion of a paper on the relation of

human and animal diseases. The following note on diphtheria in cats is suggestive, if not altogether conclusive. Shall our "rogues gallery" include "diphtheria Tommy" as well as "typhoid Mary?"

"Dr. Frank Webb (Leigh, Lancs.) said that on June 9th a case of diphtheria was notified (a girl aged nine years), and on investigation at the child's home the mother said, 'I think she has got it (diphtheria) from the cat. The cat has been bad a week; it cannot meow, and it has a funny sort of cough.' He suggested that the cat should be destroyed. That was done, but previously a couple of swabs were taken from the cat's throat. Swabs were also taken from the child's throat. Cultures from both were made on Loeffler's blood serum, and microscopic examination showed, in the case of the child and also the cat, a mixture of staphylococci and Kleb's Loeffler bacilli.

"Further investigation showed that a neighbor's cat had died ten days previously suffering with the same symptoms, 'unable to meow and a cough, unable to take food and wasting.' Later, five other cats in that street were found to be ailing and were destroyed.

"The child had been in the habit of taking the cat to bed with her regularly, and it always slept *on* the child's bed; it was likely that it also slept *in* the bed with the child."

Examinations for Hookworm Ova.

Public Health Reports of February 20 gives the following directions for the technique to be used for the examination of fresh specimens of suspected feces and for making permanent mounts. The directions are prepared by Dr. M. J. White of the United States Public Health Service.

"1. Agitate about 0.5 gram of feces with 5 or 6 cubic centimeters of water in a small test tube. The centrifuge tube is suitable.

"2. Strain through two layers of gauze to remove the too consistent particles of feces, and wash the residue with a sufficient quantitity of water so that the total filtrate will properly fill a centrifuge tube.

"3. To the tube of filtrate add and diffuse therein 5 drops of a 1 per cent. solution of 'Toluidinblau' in a 2 per cent. aqueous solution of carbolic acid.

"4. Centrifugate sufficiently, two minutes.

"5. Decant all supernatant fluid.

"6. Place two oeses of the sediment on a slide and spread by gentle pressure with a cover glass.

"7. Magnify 105 times in a subdued light (oc. 4, ob. 3 Leitz).

The dye imparts blue and purple tints to the fecal material and a light-brown tint to the eggshells. This polychromatic effect greatly facilitates the locating of the eggs, which are then magnified 370 and 1,000 times for the purpose of more definite identification of the blastomeres (oc. 1, ob. 7, and oc. 4, ob. 1-12 oil Leitz).

"These stained specimens may be satisfactorily mounted by rimming with melted paraffin. In such mounts the complete development of the egg, including the first embryonic stage, may be watched. As the egg becomes mature and the shell disintegrates, the embryo, whether dead or alive, takes on a purple color, as the result of coming in contact with the small quantity of unattached stain present in the mount. As long as the egg shell remains intact its color is light brown, but as soon as it permits the unattached dye to come in contact with the contained embryo the color of the egg changes, so that instead of a light-brown egg there is a purple egg.

"In some instances the embryos entirely escape from their egg shells and lie free in the field, but dead, having taken a beautiful purple color. In others they remain coiled up dead in the egg shells. This change increases the value of permanent mounts, as some of the eggs may remain brown, while others show the embryos stained purple. It is necessary to avoid pressure on these mounts, as the embryos are very fragile, and the movement of the surrounding air bubbles is likely to cause fracture and displacement."

Relative Efficiency of Rat Traps.

Anti-rat campaigns are becoming so general that the United States Public Health Service gives space in the February 6 issue of *Public Health Reports* to a report on the relative efficiency of various rat-catching devices as

tested by Surgeon V. G. Heiser in Manila. The report follows:

"With a view to ascertaining which type of rat trap was most effective and also the average number of rats that are caught by a given number of poisoned baits that are set out, statistics were kept during the anti-rat campaign in Manila. The ratio maintained in catching rats with two types of traps is indicated in the following table, a perusal of which will show that for the three months ended June 30, 1913, there were 120,565 spring or snap traps set and that for every 100 of this type of trap set there were caught 6.9 rats. During the same period there were 47,075 wire cage traps set; the total number of rats caught was 339; which gives 0.72 rats caught for each hundred traps set. For the quarter ended September 30, 130,627 spring or snap traps were set and 9,753 rats were caught, which gives 7.47 for each 100 traps set. During this period 40,621 wire cage traps were set and 395 rats were caught, which gives 0.97 rats caught for each 100 wire cage traps set.

"No accurate record was kept of the number of each kind of rat bait set. Only the total of all was recorded. Bacon, or cocoanut with strychnine and rice with arsenic were used. For instance, for the quarter ended June 30, 1913, there were 166,237 poison baits set in new territory and the rats found poisoned averaged for each 100 baits 0.72. During the next quarter there were 177,309 baits set in territory that had been worked over, and only 216 rats, or 0.12 rat per 100 baits were killed. From the foregoing it appears that the rat poison ranks lowest in efficiency but perhaps highest in economy. In view of the fact that the original cost of the cage trap is many times more than that of the spring trap, and the cost of maintenance is very high, it will be apparent that the spring trap is by far the more economical as well as more effective of the two."

Teeth and Public Health.

In previous issues of the JOURNAL attention has been called to the importance of oral hygiene as an essential to health and to the recent movement which is taking place toward the addition of dental inspection to medical inspection of schools and toward the establishment of free dental clinics for the benefit of those too poor to purchase health for themselves. It is now generally believed that defective teeth may produce sickness by lowering the vital resistance through the toxemia produced by the swallowing or direct absorption of pus formed within the tooth. In addition thorough mastication may be prevented so that inanition and indigestion may result and perhaps the least important is the fact that the cavities in the teeth may act as incubators for tuberculosis, scarlet fever, or other infections. Even this last has seemed so important to the Straus Tuberculosis Preventorium at Farmingdale, N. Y., that no child is allowed to enter whose teeth have not first been put in perfect condition and one sanitarian has expressed the opinion that cavities in the teeth of a patient should be filled before he can be released from quarantine when the case is a contagious disease of the respiratory tract or its adnexa.

In New York City it has been estimated that among 700,000 school children 650,000 have teeth which are in need of attention. On learning of these figures some years ago Judge Peter T. Barlow was so impressed that he enlisted the aid of some friends and established an experimental free dental clinic. This has been a great success, having treated over 20,000 cases already at a cost of less than $5,000 a year. Most of the children treated come from families with an income of about $15 per week, so it is evident that city supervision is necessary since the parents are unable to bear the whole of the usual cost of treatment.

W. H. Allen of the Bureau of Municipal Research estimates that New York needs about 600 clinics to cover the ground thoroughly and it is hoped that a similar movement may be undertaken in other cities.

The December number of the *Rochester* (N. Y.) *Health Report* contains some helpful suggestions on the preservation of teeth and digestion which are among the first requisites for good health. We quote the article entire:

"The necessity for the use of the tooth brush is being felt close to border line of poverty. Even the stupid are coming to realize that a clean mouth is a kind of esthetic

asset. And, too, visits to the dentist are undertaken for the purpose of filling teeth. It is a remarkable sign of the times when we have within a decade witnessed the removal of most of the dentists' signs which proclaimed that teeth were extracted without pain.

"Owing to the educational campaign that has been waged by the dental branch of medicine and by the social service workers, the necessity for preserving children's teeth has been brought home to most of the intelligent parents, to a great many poor parents and to even some of the stupid ones. The use of the tooth brush after meals is becoming more common, and dental floss or even the rubber band for removing particles of food between the teeth is coming into something more than occasional use.

"One of the great difficulties, however, in the way of preserving teeth, especially the teeth of our children, is the fact that we continue to feed them on "spoon victuals" instead of on food that will provide work for their teeth. We furnish our dogs with dog biscuit and then we feed our children on the inside of baker's bread and tender or hashed meats, forgetting that one of the facts the archeologist has taught us is that man in the archaic period had practically no defects of his teeth. He lived on coarse food; his flour was ground with the husks on it; his bread was frequently so dry that it had to be chewed in order to be swallowed, and much of his other food was either coarse meat or contained hard vegetable fibre. If we feed children on hard bread or biscuits that they will have to chew, we will not have to provide so much stuffing for the teeth. And, too, what is good for children is good for many adults. Someone has said that we are a civilized and constipated people; and if we cannot immediately take to bread as hard as dog biscuit for the purpose of preserving the teeth, let us, at least, take to bran bread for the relief of the sin of constipation. The following is an excellent formula for a bran flour mixture and a recipe for bran bread. The recipe may be varied by the addition of nuts or raisins; it may be baked hard and allowed to dry; but it is good for the teeth and not bad for the bowels.

Bran Flour Mixture

Bran	5 parts
Graham Flour	3 parts
White Flour	1 part

"To Make Bran Bread.—Mix one teaspoonful of baking powder with one-half cup of white flour and sift thoroughly; then take three and three fourths cups of the bran flour mixture, one pint of sweet or sour milk, three-fourths cup of molasses, one even teaspoonful of baking soda dissolved in one fourth of a cup of boiling water. Mix and bake one hour in a slow oven. This quantity will make two small loaves of bread."

Legal Control of Milk Supply.

From the *American City* of February we clip the following report of a decision on the legal control of a milk supply:

"That a city ordinance designed to protect the public against the sale of impure food, including milk, is a valid exercise of the state's police power, was decided by the United States Supreme Court in the case of Adams *v.* City of Milwaukee, 33 Supreme Court Reporter 610. It was further held in this case that such an ordinance may validly authorize summary destruction of impure milk kept for sale. The Milwaukee ordinance, involved in this suit and upheld by the Supreme Court, provides that no milk drawn from cows outside of the city shall be brought into the city, contained in cans, bottles or packages, unless they be marked with a legible stamp, tag or impression, bearing the name and address of the owner of the cows, and unless such owner shall, within one year from the passage of the ordinance, file in the office of the commissioner of health a certificate of a duly licensed veterinary surgeon or other person giving authority by the State Livestock Sanitary Board to make tuberculin tests, stating that such cows have been found free from tuberculosis or other contagious diseases. The certificate is required to give a number which has been permanently attached to each cow and a description sufficient for identification. The certificate must be renewed annually and must show that the cows are free from tuberculosis or other contagious diseases. Another clause of the ordinance

provides that all milk not conforming to the requirements of the ordinance shall, upon discovery thereof, be confiscated and immediately destroyed. These regulations were, also, attacked in the Supreme Court on the ground that there was an unconstitutional discrimination against milk produced outside the city in favor of milk drawn from cows within the city, but the court held that the mere fact that a somewhat different kind of inspection is provided for the latter class of milk does not invalidate the ordinance, sale of all milk, whether produced inside or outside the city limits, from sick or diseased cows being prohibited under the same penalty."

PERSONAL NOTES

The following were elected to membership in the American Public Health Association, March 12, 1914:

Dr. William Green Abernathy, Woodland, Miss.
Mr. H. N. Campbell, Boston, Mass.
Mr. N. J. R. Chandler, Plainfield, N. J.
Dr. David Lawrence Flanary, Dyersburg, Tenn.
Dr. Davis Furman, Greenville, S. C.
Mr. Curtis E. Lakeman, Glen Ridge, N. J.
Dr. Edward Charles Podvin, New York City.
Dr. Clarence E. Smith, Greenville, S. C.
Dr. Linsly Rudd Williams, New York City.
Dr. John Gibbon Wolf, Pueblo, Col.
Dr. Harry F. Watt, Ocala, Fla.

"After a service of almost twenty years in the Department of Health and twice commissioner of health, Doctor Lederle resigned as commissioner of health on February 1, 1914. In recognition of his splendid service to the Department of Health and to the cause of public health generally, the Board of Health at its last meeting, adopted the following resolution:

"*Resolved*, That the Board of Health of the City of New York at the close of the long career of high public service of Dr. Ernst J. Lederle, commissioner of health of the city of New York, hereby spreads upon its minutes this mark of its appreciation of the splendid vigor, profound and enlightened intelligence and lofty spirit of devotion which have characterized his fulfilment of his trust. During his administration of the department, the causes of preventable disease have been sought out, studied, and, as far as possible, eliminated with a gratifying resultant improvement of general health of our people and reduction in the death rate. The multifarious activities of the department have been systematized and brought to a high state of efficiency. For these things, this board, of which he has been a member for so long, desires to express the esteem his character and service have called forth, and of them, to make public record of this official recognition."

Weekly Bulletin New York City Department of Health. February 7, 1914.

Dr. Linsly R. Williams has been appointed Deputy Commissioner of Health for the State of New York.

PUBLIC HEALTH NOTES.

Water Purification in 1913.

From the *Engineering Record* of January 3, we clip the following summary of the progress in water purification during the past year as seen by Mr. Allen Hazen:

"The progress of water purification during the year has been considerable. Two great cities have adopted filtration and are now installing plants. One of these—St. Louis—adopted ten years ago a partial method of water purification, which marked a great improvement on previously existing conditions. Perhaps the example of other cities with more complete plants, maintaining supplies of superior quality, has served to bring about dissatisfaction with the partial purification and has led to the adoption of the more complete treatment.

"Cleveland, after persistent efforts, extending through many years, to secure pure water by driving tunnels farther out under the lake and by carrying sewage to distant points of discharge, has wisely reached the conclusion that the filtration of the water is both a more certain and more economical method of reaching the desired result.

"The defeat of a project for filtering Croton water supplied in New York City is to be recorded. The plans had been carefully prepared by competent engineers, the work had been authorized and bids received, when pressure was brought to prevent the award of a contract to any bidder. It must be considered that this important work is only temporarily postponed, for New York City will not much longer consent to be supplied with water inferior in quality to that of neighboring cities

"With filter works for Baltimore in progress, the circle is rapidly closing, and the time is not far distant when every large American city will supply to its people water of excellent quality, the quality being secured either by means of artificial purification or by other adequate safeguards.

"The year has been an important one in the development of the art of disinfection. It has become more and more clear that the proper field for this process is an auxiliary to filtration. The use of hypochlorite of lime, which became common a few years ago, has been gradually and greatly extended, and the advantages of its use have become so apparent that disinfection either in its present or some equivalent form will always be insisted upon. On the other hand, continued experience has shown the difficulty, or perhaps sometimes the impossibility, of disinfecting waters adequately with hypochlorite of lime without at the same time producing disagreeable tastes and odors. The use of liquid chlorine as a substitute is being extended, while ozone and the ultra-violet-ray methods are receiving increased attention as offering promise of being able, with improved apparatus, to furnish the desired disinfection without the production of disagreeable tastes and odors."

A Notable Step Forward.

Summing up the record of 1914 public health in Great Britain, the January issue of the *Journal of State Medicine* heads the list with the following comment:

"The most noteworthy subject of the year's work has undoubtedly been that of 'Venereal Disease,' and the ventilation of the subject is so noteworthy, not simply because of its immense importance, but because hitherto it has been relegated for discussion to scientific journals alone. *The Times* has once again proved its value to the community by a fearless exposition of facts and figures, and by calling the scourge by its proper title and not referring to it somewhat vaguely as 'the social evil,' or some other such term.

"At the conclusion of its meeting in the summer, the International Medical Congress passed two resolutions, one of which drew direct attention to the ravages of syphilis, and called upon the governments of all countries there represented adequately to deal with the question of its prevention. Almost simultaneously our own government announced the appointment of a Royal Commission; and, a few weeks later, there was

issued by the Local Government Board a most instructive and comprehensive report on 'Venereal Diseases.' There cannot be given too wide a publicity to all the facts, and now that a definite start has been made in instituting systematic inquiry it is the duty of all medical men, and, indeed, of the whole community, to see that such inquiry is prosecuted to its conclusion, and that the preventive measures to be proposed are put in force without delay."

A New Tuberculosis "Cure."

Coming so soon after the general discrediting of the Friedmann cure for tuberculosis we must, at least, compliment the optimism of the man who hopes to make a success by following in Friedmann's steps. This man is Dr. Hans Karfunkel of Berlin who, some time ago, applied to the Board of Health of New York City for permission to treat cases of tuberculosis with a culture of living bacteria. A culture of the bacteria was submitted to the board with directions for treatment and a history of the source of the culture. Investigation showed that the culture was of the hay bacillus type and could hardly have been derived as claimed and the doctor's application was denied.

Leprosy in France.

Notwithstanding the fact that the greater part of our contagious diseases are more fatal and more easily spread than leprosy, this disease invariably inspires a peculiar panic in the minds of the public. This may be a blessing, since we have faith in the dictum of Pasteur one of our first steps in banishing contagious disease from the face of the earth should be to prevent its gaining a foothold in new soil. The February number of the *Journal of State Medicine* speaks of conditions now existing in France as follows:

"Some alarm has been caused by the increase of leprosy in France, and particularly in Paris, and Dr. Marchoux, of the Pasteur Institute, is to report upon measures best fitted to prevent any further spread of the disease.

"Leprosy is a contagious malady, but exactly how it is communicated remains a mystery. No less than 5 per cent. of the sewer rats of Paris are leprous, and the number of lepers in Paris has increased in a few years from 50 to 300. In the provinces the chief centers of the disease are near Guingamp, in Brittany, where there are about forty lepers, and on the Italian frontier, where there is a colony of sixty. A few cases are also to be found at Marseilles.

"The conditions under which the disease spreads have changed but little in the provinces since the Middle Ages, and in Dr. Marchoux's opinion there is no great reason why the disease should not again become the scourge it was six or seven hundred years ago. Up to the present French legislation has in no way checked the disease, which is not even notifiable. This state of affairs is to be remedied, and Parliament will be asked to adopt a bill rendering obligatory the notification of leprosy and enforcing the rigorous isolation of lepers, either in their own homes or in special leper houses. A medical committee will be empowered to order the removal of any lepers from their homes to leper houses if they are not effectively isolated."

Fighting Bad Housing in Paris.

Perhaps the most expensive measure ever taken to improve housing conditions is that noted below, as clipped from the *Journal of State Medicine*, February, 1914:

"In the course of the next eighteen months cheap and hygienic dwellings are going to be erected in Paris (a city of high rents) for no fewer than 60,000 persons who are at present living in insanitary houses. The municipality of Paris has borrowed £800,000 from the National Pensions Office at 4.2 per cent., and has already purchased 36 acres of building land for £433,222, an average cost of 5s. 6d. per square foot. At a cost of £2,600,000, it will be possible to build 11,000 lodgings, each capable of accommodating at least five persons. These dwellings will, it is hoped, be ready for occupation in June, 1915.

"This action on the part of the municipality gives effect to a bill dealing with the housing problem passed by Parliament last year, which empowered the Paris municipality to incur direct expenditure of £6,000,000

in improving housing conditions and authorized it to make advances to the philanthropic and building societies which are trying to solve the housing problem. The council has decided to spend the remaining half of this authorized expenditure in the construction of dwellings on the site of the dismantled fortifications of Paris when the grand scheme which will give Paris yet another ring of boulevards becomes a reality.

Co-operation for Rural Sanitation.

From the *Pacific Pharmacist*, January, 1914, comes the following timely note on sanitation in rural districts. While the remarks are especially aimed at California, the awakening of the conscience of those druggists who sell the most worthless and even dangerous patent medicines without hesitation would be a fine idea anywhere.

"We feel that a subject of the greatest importance and one which is almost totally neglected by the State University, is a campaign to improve the sanitation of the rural home. Those who pay the taxes which maintain the university have a right to expect some return benefit. There should be a complete campaign directed against the dissemination of disease in the rural districts. Sanitary home building, care of the body, methods to prevent the spreading of communicable diseases, water supply, sewage disposal, care of the sick, pure foods, pure and wholesome drugs, etc., should be explained and taught in the home or in the community. This propaganda work could be carried out by means of lecture courses and by means of circulars. The influence of the medical quacks which reap such a rich gain from the rural districts should be counteracted. It seems to us that in this particular work the assistance of the pharmacist could be utilized. It should be the special duty of the country practitioners to advise regarding general preventive medicine and for the druggist to assist the physician in this work giving special attention to the use of medicamenta which are of unquestioned value in the treatment of ailments, and using every effort and influence to overcome the tendency to resort to the use of patent and quack remedies. It is in the rural districts where the medical frauds reap their harvest. What the farmer wants is some simple sound advice to steer him clear of the quacks and aid him in a better mode of living. The university should place this work in the hands of men who are competent by training and experience."

Educational Articles for Public Health Nurses

"The *Public Health Nurse Quarterly* intends to publish during this coming year a series of articles which, as a whole, will represent in greatly condensed form some of the more important courses of study which are being presented to postgraduate students in public health nursing at Teachers' College, Columbia University, New York, and at three postgraduate centers in connection with the Visiting Nurse Associations in Boston, Philadelphia and Cleveland.

"These articles are to be written by the men and women who lecture at these schools, and will be presented by them in a way to make more general some of the essential principles which characterize and form the basis of constructive nursing for the public health.

"The following is a very incomplete list of some of the subjects treated in these postgraduate courses:

"1. Principles and Procedures of Public Health Nursing.

"2. Municipal Sanitation.

"3. Rural Sanitary Problems.

"4. Basis of Social Legislation.

"5. Preventive Medicine in Nursing.

"6. Food Economics.

"7. Psychology as Applied to the Problems in Public Health Nursing.

"8. The Immigrant and Social Backgrounds.

"9. Administration in Public Health Nursing."

The Public Health Nurse Quarterly, January, 1914.

Medical Inspection of English Schools.

The *Journal of State Medicine*, December, 1913, tells of the method which has been introduced in England to put the medical inspection of school children on a sound basis. We quote the article entire as follows:

"The Board of Education has recently

issued new regulations in respect to grants for the medical inspection and treatment of elementary school children. Provided that the board is satisfied that medical inspection and treatment are satisfactory, they will hand over roughly one-half of the expense incurred to the authority. Such a step as this should prove both a relief and a stimulus to the education authorities. In the case where satisfaction has not been given to the board, they may reduce or withhold the grant altogether. A Royal Commission has testified that the real means of improving the physique of the nation lies in the detection and cure of disease in childhood. The board mentions as two of the points to which special attention will be given in assessing the amount of the grant: (1) The extent to which school medical service is coördinated with the local public health service; (2) the provision for rendering it an integral part of the local system of elementary education. It will, therefore, be seen that the first point aims at economy, the second makes for efficiency and uniformity. In the case of children suffering from tuberculosis or other ailments requiring open-air treatment, a maximum grant of £3 will be paid per unit of average attendance in the case of open-air day schools, and £8 per unit in the case of open-air residential schools."

Railway Sanitation.

The following clipping from the *Medical Press* indicates that conditions of railway sanitation in England are as primeval as in this country. The type of American car referred to is unfortunately rare.

"Cleanliness is comparative. Railway trains are now cleaner, no doubt, than they were twenty years ago, but they are still far from being perfect. The companies are providing more sanitary accommodation of some sort or another, but their standard is still far below what should be tolerated. Lavatories at stations are on the whole fair, and the more odoriferous examples are not so much the fault of the system in vogue as of its application. The glaring faults lie in the methods of disposing of sewage on trains. To scatter human excreta broadcast along a track should be unthinkable in an age such as ours. Railways run through thickly populated country, and expresses dash through our largest towns leaving behind them matter at the best offensive and at the worst dangerous to life. Water supplies to cities are carefully chosen. Mountain streams are tapped and their pure water carried for miles so that their city may be safe. At any moment these streams may be contaminated by a defaecating passenger, and this danger is the greater because it is wholly unsuspected. Some American companies make arrangements for the sewage to be removed from cars when they are on sidings for the night. There is no reason why some such system should not be universal. The present one, at any rate, is an intolerable anachronism. It is not many years since a serious outbreak of typhoid fever among railway navies on an American line was proved to be due to contamination of the line from passing trains."

An English Tuberculosis Dispensary.

The following brief note from the *Modern Hospital* of December, 1913, tells of a method of organization for the fight against tuberculosis which not only sounds very promising but appears to have met with success as far as it has gone:

"Birmingham has always been a city in which the importance of linking up the various health agencies and after-care organizations has been recognized. The latest addition to its preventive work, since after-care must be included in that term, is the new tuberculosis center and city analyst's laboratory, says the London *Hospital*. It consists of a waiting hall, with consulting, inoculation, and dressing rooms for both sexes and a joint dispensary on the ground floor. The upper part of the building is occupied by Mr. J. Liversege's laboratory as city analyst. The aim, of course, of the center is preventive and consultative work. It will be a center for the examination of "contacts" and a general information bureau open to every citizen. As a center for educational propaganda also it is hoped to do much good work, and during the winter there is a project for holding a course of lectures to patients and their friends. At

the present time—for part of the institution has been in use for some six months—900 patients a week are being dealt with. Few things have been more remarkable in institutional development of late years than the way in which the dispensary has grown from a single department into a unit embracing educational, consultative, and specialized branches. The dispensing is now only one part of what is virtually a new institution which the word 'center' not inaptly describes.

Public Welfare Workers.

"The people of Chicago, under the leadership of President A. A. McCormick, of the Board of County Commissioners, have decided to drop the term 'Social Service' as applied to those who are engaged in work for the betterment of the poor and sick, and to use instead the term 'public welfare.'

"The new term really had its christening on the evening of November 22 at a great dinner at the Sherman House in which several hundred 'public welfare' workers participated. Dr. Richard C. Cabot of Boston, one of the guests of the occasion, eulogized the new phrase as expressing more than any other term he had heard used in the same connection.

"President McCormick deprecated any reference to his own part, either in the discovery of the new term or in the work to which it applied. He said that it had been his experience that almost every new idea that was concerned in the welfare of the people came from some woman, and that the coinage of 'public welfare,' as expressive of what we have been calling social service, was a woman's work."

The Modern Hospital, December, 1913.

Rehabilitation of Boiled Milk.

"So well have we been trained by the child specialists and the sanitarians, that most of us look on boiled milk as a simply impossible food for babies. But it is the boast of medical science that she never stands still and what we look on with horror one day, we may have to embrace the next.

"Boiled milk has always maintained its place as food for infants on the continent, but has had few champions in England or America, Dr. Abraham Jacobi being almost the only pediatrician of note in this country to use it. Recently, however, it has been subjected to an exhaustive examination in England and has come through with flying colors.

"One of the government Blue Books contains a report on the 'Biological Properties of Milk,' made by a woman doctor, Janet Lane-Claypon. That boiled milk forms in the baby's stomach a much more delicate and friable curd than raw milk is a well-known fact and in Germany, where its use is general, physicians have always claimed that less trouble was experienced from infant diarrhœa in bottle-fed babies than here or in England, where raw milk is used (pasteurized milk has not gone through the changes which boiled milk has and counts as raw in this respect). Even in America boiled milk is sometimes used to check diarrhœa.

"However, we have been taught not only that boiled milk is constipating, but that the heat has destroyed ferments and other biological substances essential to nutrition, and that babies will starve on a diet of boiled milk.

"As for the first of these objections, it is now asserted that constipation is so light an evil, compared with diarrhœa, that the physician hails it with something like relief.

"As to the second, Dr. Lane-Claypon goes exhaustively into the question of the heat-sensitive biological substances in cow's milk and concludes that the ferments which have always been looked upon as so essential are really not present at all in pure milk, but are always derived from bacteria.

"The other substances, those concerned in producing immunity to disease, are found only in the colostrum and, if they appear in any quantity in the later milk, it is as a result of inflammation of the mammary gland. But even more, the capacity to absorb these substances from the digestive tract is lost after the first few days of life and therefore, 'the oft repeated assertion of the value to the infant of raw cow's milk fades away when the facts are examined, since in cow's milk it is found that these so-called biological substances are not absorbed in the alimentary canal, but are destroyed there.'

"On the whole the conclusion of the report is that between raw cow's milk and boiled,

the advantage is with the latter, as boiled milk is germ-free or nearly so, does not form a hard curd and if not raised above the temperature of boiling water, the heat has not destroyed or apparently injured any of the chemical substances necessary for the health of the child.

"It must be remembered that the comparisons are between raw milk and cooked milk of *another species*. The results would be quite other if we compared raw and boiled human milk.

"One or two evangelists are not enough to bring about a reformation and we shall not see pasteurized milk giving way to boiled milk at once. But it would be a happy day for municipal health authorities, for institutions, and for visiting nurses if the results of this English report came to be generally accepted and the complications of pasteurization were succeeded by the simplicity of boiling."

Alice Hamilton in *The Survey*, December 13, 1913.

The Cost of the Tuberculosis War.

"Out of nearly $20,000,000 spent last year in the treatment and prevention of tuberculosis in the United States, 69.3 per cent. of the money was derived from public funds, either Federal, state, county or municipal. These are some of the interesting figures given in the annual statistical statement of the National Association for the Study and Prevention of Tuberculosis, recently made public. The statement is based largely on actual reports received from anti-tuberculosis agencies throughout the country, but where reports were not available, the figures have been estimated.

"Treatment of tuberculous patients in the more than 500 sanatoria and hospitals of the country and the construction of such institutions cost over $18,000,000 of the total expenditure. Care of patients in dispensaries and open-air schools cost about $825,000. Anti-tuberculosis associations and committees spent nearly $675,000 in furthering their work of organization and education, while state and local boards of health and special tuberculosis commissions spent over $250,000.

"More than $13,800,000 or 69.3 per cent. of the total expenditures came from public funds. The National Association points to this growing increase in the spending of public money for tuberculosis as one of the most significant facts in the report, as it indicates the shifting of the burden of institutional care of consumptives from the private purse to the general public purse, where it rightly belongs. Since 1909 the percentage of public money spent in tuberculosis work has increased from 53.5 to nearly 70 per cent.

"New York state spent more money in tuberculosis work than any other two states, due largely to the increased and growing activities of city and county governments in building adequate hospitals for consumptives. The following table shows the estimated public and private expenditures in each of the five leading states:"

EXPENDITURES IN 1913.

State.	Public.	Private.	Total.
New York....	$3,455,638	$1,429,196	$4,884,834
Pennsylvania .	1,629,195	458,099	2,087,294
Illinois.....	1,341,289	533,810	1,875,099
Massachusetts	1,138,521	300,158	1,438,679
California....	330,322	492,293	822,615

The International Hospital Record, February 5, 1914.

New Method of Sewage Treatment.

"Recent experiments at the Lawrence Experiment Station of the Massachusetts State Board of Health, as described in the article by H. W. Clark and G. O. Adams in the *Engineering Record* of February 7, suggest that aëration of sewage for a period of some five hours in a five-foot tank containing vertical layers of slate about one inch apart may be utilized to greater advantage than hitherto thought possible. It appears that a substantial portion of the increase in stability, or reduction in the putrescibility, of the sewage is due to the clarification brought about by elimination of the semi-soluble organic matters frequently spoken of as "colloidal" matter. This separation of non-settling substance contributing largely to the putrescibility of the sewage is promoted by the aëration and also by the growths or deposits which occur upon the surface of the slates. The tank is operated on the fill-and-draw plan, the sludge and detached growths from the slate surfaces quickly settling to the bottom of the tank after aëration ceases.

"Direct oxidation of organic matter is not a controlling factor in removing organic matter, as indicted by numerous earlier investigations, and also by recent tests at Lawrence. It is important to note, however, that the treated sewage is claimed to have lost all of its offensive odor.

"In some ways these important investigations give promise of more efficiency in bringing about the "de-solution" of objectionable non-subsiding organic substances than could be reasonably expected from studying any of the results of the experiments of Dr. Travis at Hampton, Norwich or elsewhere, or of Mr. Dibden at Devizes or elsewhere. Aëration seems to promote the separation of colloids to a greater extent than anticipated by the English investigations or by Black and Phelps, who worked with tanks containing no slates or other colloiders.

"The amount of air required seems to be comparatively small, both in point of quantity and expense. The experiments at Lawrence are striking in the elimination of odor from the sludge and the aid which the treatment is as a preliminary to filtration of the local sewage at rates far in excess of those hitherto employed in practice. It is stated that the purification data apply either to fresh or stale sewage.

"A possible difficulty arises in that the aëration of sewage may of itself cause a serious nuisance from odors, such as reported in the aëration experiments of Dr. Dupre in London in the early '80s. This might be specially marked with stale sewages.

"On the whole, the experiments are noteworthy in suggesting the beginnings of a new style of treatment, which, however, ought to be tried out on a larger working scale before final conclusions are drawn as to its usefulness for plants in practice."

Sewage Purification—New Jersey.

With the present rapid increase in the number of installations of sewage systems and sewage disposal works and of water supply and water purification systems the Board of Health of the state of New Jersey has found it advisable to draw up a set of rules governing the submission of designs for such works. R. B. Fitz-Randolph, chief of the Division of Food, Drugs, Water and Sewage, in writing relative to the rules says that before their adoption plans were submitted "in all sizes up to six feet by ten feet and on all kinds of paper from the wrapping kind up to tracing cloth."

He continues: "It is also an unfortunate circumstance that some few engineers who have worked along other lines will accept work designing municipal sewage disposal or water purification plants apparently without investigating the underlying principles as thoroughly as is desirable. It then becomes necessary for the state authorities to gather detailed data regarding the project which very often cannot be done as efficiently as would be best because of the small number of engineers which may be employed with the present annual appropriation.

"The present rules are, therefore, intended to prevent loss of time incident to the collection of fundamental data, upon which the design is based, and also to make the plans and reports more uniform in character.

"Before taking final action upon the regulations they were submitted to several of the leading sanitary engineers, with the request that comments and criticisms be made. It was the intention of the board to see that no unjust provisions should be included which would cause unnecessary expense or hardship upon the part of the engineers. Many helpful suggestions were made by these engineers, and the board desires to express their appreciation of the time and trouble which was taken in making the replies.

"The regulations were prepared by C. G. Wigley, engineer of the board, under the supervision of R. B. Fitz-Randolph, chief of the Division of Food, Drugs, Water and Sewerage, and adopted by the Board of Health of the state of New Jersey June 23, 1913."

That the regulations are good and that there is a demand for them is attested by the fact that the State Board of Health of Louisiana has already adopted the same set of rules almost without change. It may be found that this furnishes a good beginning for an even wider-spread standardization of health work.

INDUSTRIAL HYGIENE AND SANITATION.

American Labor Legislation.

It is extremely encouraging to note the optimistic tone of the last *American Labor Legislation Review*. (December, 1913).

The marked contrast between conditions of the past and those of the present are vividly shown.

"The old idea of labor law enforcement, of policing a state, no longer commands respect. The 'detective method,' valuable and necessary as it is at times in uncovering hidden violations of the law, is nevertheless to be condemned when it becomes the habitual form of inspection. An army of the most skilled factory inspectors would be totally unable to enforce every provision of the factory laws. Moreover, few inspectors, even with previous technical training, would be able intelligently to pass upon proper provisions for safety, comfort, and health in a succession of establishments including processes and danger points so extremely varied."

The fundamental defects of earlier legislation were threefold: first, the incompleteness of the labor laws, allowing many danger points to go unguarded; secondly, the absence of direct responsibility, thus placing no obligation upon the employer to safeguard the employee except "as the commissioner so directs," and thirdly, the absence of well defined provisions for safety and health, leaving an indefinite law to be enforced by a poorly trained and poorly paid inspector. The results, of course, were very unsatisfactory, but were no less than might well have been expected.

In view of past conditions the following words are not a little gratifying:

"Within the last three years we have entered upon a new era in factory inspection. The recognition that administration is the most important problem in labor legislation is working a revolution in this field. There is a new spirit in the work—the spirit of coöperation. The practical experience of the worker, the resourcefulness of the employer, the critical, constructive ability of the expert—all are needed in the framing of reasonable standards of protection. It is the lack of coöperation of these three groups in the past that has left unnumbered thousands yearly to suffer for the want of protection; it is the new spirit of coöperation in the administration of labor laws that is the promise of the future."

It is pleasant to be able to congratulate the efficient officers of the American Association for Labor Legislation not only on the excellence of their quarterly publication, but on the beneficial activity displayed in all fields of betterment of industrial conditions.

The Cost of Preventing Occupational Diseases.

The November number of the *Monthly Bulletin of the Ohio State Board of Health* discusses this topic at some length. Certainly the agreement that the cost of appliances to prevent occupational accidents and diseases will add to the already high cost of living is the most flimsy of all, since the cost of accidents not only falls upon the people as directly but is much greater than the cost of prevention. For example, the State Actuary of the Ohio Liability Board of Awards reports 1,220 eye injuries costing $23,000. Of these 99 per cent. were preventable and $500 would have paid the cost of prevention. The article says:

" 'We cannot expect the risks of a trade to be borne entirely by the tradesman, who has only partial control, if any, over them.' If it is dangerous to human lives to manufacture a certain article, then the cost of manufacturing should include the cost of the conservation of health.

" 'The expense of maintaining hygienic and sanitary conditions of work, and of instructing workmen and disciplining them must be charged, as is the cost and up-keep of machinery, to the cost of the goods manu-

factured. Several experiments along this line have already shown that the increased cost of goods to the public has amounted to less than 3 per cent. to accomplish these things, while, when such changes are universally made the decrease in the cost of private and public charities is marked. Witness the result in the United States Army and Navy, and at Panama. Typhoid fever, smallpox and tropical diseases have been practically wiped out while venereal diseases are rapidly on the wane, all due to measures of prevention.

"Money put into hygiene and sanitation of any character must be regarded as an investment, from which definite returns are to be expected, and must not be considered in any sense an unprofitable expenditure.

"Money spent on so-called 'workmen's welfare' is merely a policy of business economy with many angles to it, and not a matter of philanthropy."

Spreading the Knowledge of Industrial Poisons.

"Some eight years ago a committee representing four great European countries, namely, Great Britain, Germany, France and Italy, was named to study the conditions of the industrial world which were directly responsible for diseases caused by obnoxious substances; the kinds of poisons causing the diseases, and the methods to be used in prevention. After nearly eight years' work this committee has prepared a complete list of the poisons which are found in occupations. In order that the physicians of Ohio and those manufacturers who are interested in this subject may have a better understanding of this phase of industrialism, we are reprinting this report, translated from the German, in this issue of the *Monthly Bulletin*. It may also be found in the United States *Labor Bulletin No. 100*. The relationship between industrial poisons and poisoning is clearly seen. It is interesting, however, to know that this entire list of poisons, comprehensive as it is, still constitutes probably less than 10 per cent. of the causes of disease conditions which are associated with occupations. By this we mean those conditions which cause anemia, tuberculosis, pneumonia, Bright's disease, heart disease, nervous afflictions, premature old age and other diseases which follow direct exposure to non-poisonous dusts and irritants, as well as extremes of heat, cold, fatigue and like conditions.

"There is no question but that the manufacturer who faces this phase of his industry and uses the proper means of prevention will be increasing his dividends, as the loss or even temporary disability of an experienced employee must of necessity have its economic considerations. In some instances definite measures must be taken to prevent the inception of the poisons mentioned; however, we would particularly call attention to the short summary at the end of the list, specifying the general means to prevent practically all of the occupational diseases due to these poisons."

Monthly Bulletin, Ohio State Board of Health, December, 1913.

Problem in Mortality Statistics.

At the XV International Congress on Hygiene and Demography, Dr. Jacques Bertillon, as the representative of France, gave an interesting address upon "Occupational Mortality and Causes of Death." Doctor Bertillon confined himself chiefly to the discussion of the difficulties that confront the statistician of occupational mortality.

The speaker dwelt at length upon the technical difficulties involved in the compilation and interpretation of trustworthy tables of mortality. He said in part:

"Nothing requires more discrimination than the construction of tables of occupational mortality. Obviously the calculation of this ratio, 'To 1,000 butchers, how many butchers died?' presupposes that one knows: (1) the number of butchers living; (2) the number who died. Now one cannot know either of these numbers exactly. In fact, on the census day a certain number of butchers think they answer the question about their occupation correctly with the word 'merchant' without saying what sort of business they carry on. But worse still, one has no assurance that he who declares himself a 'merchant' will be so designated on his death certificate. To further complicate

the situation it is found that in mortality reports the words, hosiers, hatter, clothier, etc., are applied to those who manufacture and also to those who merely sell."

From the above considerations and others, the speaker draws the conclusion that "It is not wise to calculate mortality except for the most clearly defined occupations."

The necessity for studying occupational mortality in connection with age cannot be too highly emphasized. For example, landlords show a high mortality, although their occupation is neither laborious nor unhealthful. The explanation is that men do not ordinarily become landlords until late in life, and consequently they have the mortality of the aged. On the contrary, soldiers are found to have an apparently low mortality, but this is due to the fact that soldiers as a class are young. When their mortality is considered with reference to age, the death-rate is found to exceed the average for that age.

Furthermore, many occupations demand only strong men to carry them on. When the worker's strength finally gives way he turns to some less strenuous occupation, thus producing a low mortality in the former occupation and a high mortality in the latter.

The subject is of unquestioned interest to the statistician, and, if anyone should desire a more comprehensive discussion of the subject, it may be had in the *Recueil de Statistique Municipale de la Ville de Paris*, Vol. III, No. 4.

The Significance of Fatigue in the Industries.

The importance of fatigue in connection with the occurrence of occupational disease and accidents has only recently been recognized and given scientific consideration. The subject, however, was discussed somewhat at length at the XV International Congress on Hygiene and Demography, held in Washington in 1912. These addresses were subsequently printed in volume III of the "Transactions" under the subject of "Hygiene of Occupations."

In speaking of the "Effects of Temperature and Humidity on Fatigue," Dr. Frederic S. Lee concludes his remarks with the following summary:

"When an individual is subjected to an atmosphere that is charged with an excessively high temperature and high humidity, his bodily temperature is raised, his working power becomes limited, and there is an early oncoming of fatigue. In addition to the normal fatigue substances there are present other substances, products of an abnormal metabolism, perhaps of increased protein disintegration, which likewise act as fatigue substances. Both the normal and the pathological fatigue substances act toxically to diminish the activity of the tissues, and such fatiguing action is rendered greater by reason of the abnormally high internal temperature that is present."

The importance of these physiological and pathological effects of high temperature and humidity is rendered quite evident when one considers the several industries where such conditions are prevalent. In this class would fall such as mining, baking, laundering, and some kinds of cotton weaving. The peculiar nature of these make it necessary that more than average precautions be taken to render the employees safe and efficient.

Dr. Shepherd Ivory Franz, of George Washington University, delivered an address, entitled "Fatigue Factors in Certain Types of Occupations," in which he gave the results of experiments on (1) the relation of the speed of performance to accuracy, (2) the relation of the extent of the movement to its accuracy, and (3) the effects of changing of speed upon the accuracy of performance.

The experiments themselves were quite simple, yet they involved in their proper relations the elements of time, accuracy, and movement. The subjects under observation were required to strike at small circles with the point of a pencil. The rate of movement was determined by the aid of a metronome. The extent of movement and the rate was varied greatly in the several series of experiments and the accuracy recorded in terms of hits and misses. The results can best be stated in the author's own conclusions:

"1. Fatigue is evidenced by inaccuracies of movement, as well as by the lengthening of

the time of movement and by a decreased performance of mechanical work.

"2. With increased speed, error increases, but the error increase is much greater than that of speed.

"3. In extended series of movements at high speed there is a tendency toward a lack of coördination.

"4. The error, or fatigue effect, at slow speed, at the end of about 600 movements, is about the same as that at medium speed after about 500 movements, and that at medium speed, at the end of about 6,000 movements, about the same as that at high speed at the end of about 500 movements.

"5. Changing the rate of movement increases the proportionate errors, making them greater than those when the speed is a constant, and decreasing the speed increases the proportionate errors, although not proportionately as much as when there is an increase in speed.

"6. The inaccuracy in movement increases as the extent of the movement increases, but is not directly proportional."

From these results it is obvious that the relation of accuracy to time and movement furnishes a very practical problem for those industries where high speed is maintained and where the practice of 'speeding up' is indulged in.

The question of fatigue will doubtless receive greater attention in the future, not only from the standpoint of public health at the hands of the hygienists, but also from the standpoint of efficiency and good business policy by the employers themselves. That much susceptibility to disease, and, therefore, disease itself is due to fatigue and resultant weakened vitality from the high nervous and muscular strain in industrial work, can hardly be questioned. That many industrial accidents are due to the same cause needs but little proof. That the employer himself would profit by minimizing the fatigue, and thereby conserving the energy of the worker, is, without any attempt at proof, at least a feasible proposition.

The Joint Board of Sanitary Control.

One of the best examples of coöperation in sanitary matters between the employer and the employed is to be found in the cloak and suit industries of greater New York. Constant unrest in the industry, with several successive strikes and subsequent loss to both the workers and manufacturers, led to a final settlement in 1910 by the famous "Protocol of Peace," which provided for settlement of disputes by arbitrations and for the establishment of a Joint Board of Sanitary Control to adjust all matters pertaining to hygiene and sanitation.

The board consists of two nominees of the Manufacturers, two nominees of the Unions, and three to represent the public. This board has full power to set standards of sanitation which both the Manufacturers and the Unions are obliged to maintain to the best of their ability.

The first half-year's work consisted merely in collecting data concerning the existing conditions in the industry. It was found that with only one exception none of the shops were in a thoroughly good condition from the standpoint of sanitation and fire prevention. The chief dangers to life and health were found to lie in the inadequacy of protection against fire, lack of toilet and washing facilities, inadequate ventilation, improper lighting, general uncleanliness, and certain harmful effects peculiar to the industry.

The work has now been pursued for over three years, the third annual report being issued in December, 1913. While the board is free to state that the conditions are not as they should be even yet, the report shows that the results thus far obtained are very gratifying, indeed. The number of shops and buildings with no fire-escape have been reduced from 25 to 19; using artificial light, from 373 to 29; with no protection from glare, from 1,037 to 15; with improper toilet facilities, from 142 to 7; with foot power used, from 469 to 235, etc. These are only a few from a long list of items, but they are sufficient to show a marked improvement of general conditions.

The fundamental principle underlying the movement, namely that of coöperation between employer and employee, is the key to many of our social ills, whether sanitary or otherwise. It is practically impossible to

inject cleanliness and carefulness into a wilfully careless and filthy individual. The success of the above plan, therefore, depends upon the earnestness of the contracting parties as well as upon the integrity of their representatives. These two essentials seem to be assured in the case of the industries under consideration, and it is to be hoped that others will profit by the example they have set.

Employers' Welfare Work.

The employers' welfare work has been a subject for keen controversy since its very beginning, one side supporting the movement because of the much needed relief given the workers, the other opposing the work because of the selfish motive and the alleged paternalism underlying the movement. No one doubts the good afforded the workingmen, and the employers admit frankly that it is a good business policy and results in a better labor force; but regarding the paternalism there seems to be scant evidence for the allegation.

Bulletin No. 123, of the U. S. Bureau of Labor Statistics, by Elizabeth Lewis Otey, Ph. D., contains the report of a study of the employers' welfare work in the United States. Regarding the pro's and con's of the question, the author says:

"There is a tendency in labor circles to condemn employers' welfare work. It is claimed that much of it is tinctured with paternalism and fosters a spirit of dependence on the good will of the employer incompatible with the aims of labor, and as a result the workers never reach their full development. The demand is for rights, not charity; that workers be paid enough and then left to order their lives as they see fit. It is rather taken for granted that welfare work is done at the expense of wages; that if the employer were without this particular fad the sum expended on it would be added to wages. This view is based on an assumption impossible of proof, but a priori argument is of course against it, as welfare establishments, paying a lower wage, would be unable to compete in the labor market with the ordinary establishment doing no welfare work.

"A further objection to welfare work is that it is begun and maintained to prevent strikes and labor organizations. Obviously this position is well taken. To cite French experience, the verdict there is that establishments with welfare work have been less exposed to labor troubles than those without.

"There is, on the other hand, quite a strong sentiment in favor of welfare work. In a large philanthropic society, composed chiefly of capitalists and employers, a special welfare department has been organized with committees in different parts of the country especially to interest employers in improving the working and living conditions of their employees. Their methods are educational, 'conservative and non-aggressive.' The endeavor is to show employers what other employers have done for their employees, and to make 'tactful and comprehensive suggestions' to them."

In the above investigation there were visited about fifty establishments of a widely varied nature, including manufacturing and mercantile establishments, and public utilities. Space will not permit of a detailed discussion of the many features of the welfare work, but it might be of interest to our readers to merely enumerate some of the great variety of helpful measures taken by employers to insure the safety, health, comfort, and pleasure of their employees. A few of the more characteristic are as follows:

Kitchens, lunch rooms, and restaurants conducted at cost.

Rest rooms and dressing rooms.

Washing and bathing facilities, with soap, towels, and lockers.

Libraries and clubhouses.

Sanitary inspectors.

Proper heating, ventilation, and lighting

Safeguarding of machinery.

Dust removal.

Desirable cottages at low rent.

Landscape gardening.

Fields and equipment for athletic games.

Vacations with full pay.

Advance of salaries according to merit.

Lectures and entertainments.

Night schools, and apprenticeships, and preliminary training.

Visiting nurses, and emergency hospitals.

Sick benefits, accident insurance, and pension systems.

Mutual benefit associations.

Profit-sharing, and savings banks.

These few typical examples show the broad field available for welfare work, and it is to be hoped that they may prove suggestive to those employers who are not doing their share to render the conditions of their employees safe and desirable. To quote Doctor Otey in conclusion, we can all agree that, "The sphere of welfare work would appear very definitely marked. Where the standard of living of employees is low, where illiteracy is prevalent, where an increase in wages fails to call forth increased industry on the employees' part, but merely means idleness and stopping work until the surplus is spent, where shiftlessness and extravagance are common characteristics, the employer's efforts to better such conditions are welcomed."

Office Sanitation.

Doctor Howarth, medical officer of health for the city of London, gave an address at a recent meeting of the Women Sanitary Inspectors' Association in which he discussed "Sanitation and Sanitary Law as Affecting Offices and Office Workers." He showed that while the mortality rate for clerks was lower than among other occupied males the tuberculosis death-rate was above the average. He points out that the sedentary nature of the work, the cramped position, the strain on eyesight and the general loss of tone consequent upon all these evils made a higher standard of sanitation necessary in offices and that they should be included in the term "workplaces" so that the same standards of cleanliness, lighting, ventilation, toilet accommodations, etc., should apply to them as to the shops usually covered by the term.

He suggested the following additions to the Public Health Act:

"(1) A definition which would specially bring certain places within the meaning of the word "workplace," *e.g.*, offices and restaurant kitchens.

(2) Increased powers for dealing with underground offices, on the lines of the Underground Workrooms Bill.

(3) Underground offices to be notified to the local authority for registration and inspection. This principle, if its value were proved, might be eventually extended to all offices.

The Safety Movement.

"Public recognition of well-doing is of more importance to a corporation than to an individual. The latter gets from it a little personal satisfaction, or, at best, a stimulus to increase his effort in the proper direction. Commendation of the corporation, however, does more than bring satisfaction to the constituent individuals or stimulate them to greater personal effort. It promotes faith and pride in the organization, a feeling that united efforts are more productive than those that are scattered. The organization whose employees are proud of its achievements and go out of their way to tell about them is marked for success. It is for this reason that the award of safety medals by the American Museum of Safety is of such importance. The employees of the United States Steel Corporation, of the New York Telephone Company, of the Allgemeine Electricitäts Gesellschaft, and of the Southern Pacific will be stimulated to greater efforts along safety lines now that their work has been recognized. The spirit of competition, too, will stimulate other corporations and their employees to greater activity."

Engineering Record, December 20, 1913.

Grinding Wheels.

The dangers incurred in operating grindstones and emery wheels are very clearly and compactly set forth in two pamphlets, entitled "Grinding Wheels" and "Safety as Applied to Grinding Wheels," published by the Travelers Insurance Company and the Norton Company, respectively. In these pamphlets a very complete discussion of the subject is given, accompanied by copious illustrations of the various devices for preventing accidents.

The following are given as the commonest causes of accidents:

Fouling of work between the rest and the wheel.

Improper mounting.

Overspeed.

Heating of the spindle, and resulting expansion, when bearings run hot.

Excessive pressure of work against the wheel, and the consequent heating of the rim.

Allowing spindles to become loose in the boxes through wear.

Allowing wheels to get out of true.

Carelessness.

Too much emphasis cannot be placed upon the necessity for guards against breakages and protection from dust. Sometimes these two ends are accomplished by a single device which is a combination of a protection hood and dust hood. Where a dust hood is not attached it is necessary for safety that goggles be worn when grinding is done.

Invaluable suggestions are given in the above pamphlets in regard to proper mounting, safe speed, testing of wheels, protecting hoods and flanges, speed changing, and the like.

One of the chief difficulties in remedy in conditions lies in the reluctance of the workmen to use the various safety devices and to take the necessary precautions against accidents. The objections to the use of safety devices are, doubtless, more imaginary than real, and arise from an inherent dislike to discard old habits and to form new ones. It seems advisable to institute a campaign of education against this natural inertia of the workmen and thereby enlist their earnest support for the safety movement.

Scaffolds.

The Illinois Steel Company has issued a very valuable pamphlet dealing with the proper construction specifications and operating rules for scaffolds. The compilation was made by the safety committee of the company and while the treatment of the subject concerns itself especially with the steel industry, it, nevertheless, is of general application to scaffolds in any construction work.

Regarding the construction specifications, the proper quality and size of the lumber is specified, and general formulae are given for columns, flexure of beams, standard steel pipe beams, etc. Specifications for flooring, swinging scaffolds, pipe needle beams, suspension of scaffolds, roof truss scaffolds, and the like are given in detail. Also a detailed description, with plates, is given of the various kinds of scaffolding necessary for the construction and repair of smokestacks.

The committee has added a list of general instructions for the safe operation of scaffolds. They are substantially as follows:

All lines, hooks, tackles, slings, lumber, etc., shall be inspected before being used.

Only experienced and reliable men shall be employed in the construction of scaffolds.

When a tackle rope is in danger of being affected by heat, a workman shall be left below to take care of the surplus rope.

Rope knots shall have ends tied with smaller cord, to prevent them becoming untied.

Condemned ropes shall be so destroyed that they cannot get back into service.

Hot blast stoves or stacks shall not be painted when hot enough to char or injure ropes.

All needle beams, supports and flooring of scaffolds shall be thoroughly tested by at least double the load which they are to carry, before being used.

When scaffolds are supported by tackle, the scaffold shall be raised a few feet from the ground and tested by at least double the load it is to support, before it is raised to position.

All temporary scaffolds shall be removed as soon as work is completed.

Every employee, before going upon any scaffold of any description, must see for himself that the scaffold and its supports are properly built.

Men working at high elevations, from which they are liable to slip, or when working on smokestacks of scaffolds supported by tackle, shall, when practicable, wear safety lines and belts.

The above rules are of general application and may well be followed by anyone who has to do with the operation of scaffolds. The circulation of such literature among workmen will undoubtedly aid in lessening the number of preventable accidents.

Garment Workers vs. Tuberculosis.

When the working people reach a place where they take care of their health without being forced to do so the outlook for effective work by the health officer becomes promising. The following note from the *Journal of the Outdoor Life* strikes a very hopeful note:

"A permanent injunction and a 'closed shop' against tuberculosis might be said to characterize the stand recently taken by 9,000 members of the Cloak and Skirt Makers' Union in New York City and made public in the third annual report of the Joint Board of Sanitary Control, just issued.

"A preliminary physical examination of 800 workers, undertaken in 1912, showed over 62 per cent. suffering from one or more diseases. Accordingly a lively educational campaign was started among members of the unions, to point out the danger of working in shops side by side with sufferers from tuberculosis, and the mutual advantage of making it possible for such sufferers to withdraw from active work until their condition is improved.

"A proposition to raise a joint annual fund for tuberculosis insurance from manufacturers and employees met with vigorous opposition from the union and was voted down. However, the board continued its propaganda throughout the winter and last March, after a referendum vote, Local No. 35 of the Cloak and Skirt Makers' Union, consisting of 9,000 pressers, adopted a resolution establishing a tuberculosis benefit for its members, supported by a per capita tax of one dollar a year. In addition to providing for medical examination of all suspected cases in the union, the resolution called for admission, and the rejection of any suffering from tuberculosis.

"Of 994 members of Local 25 examined, sixty-five, or 6.5 per cent., were suffering from tuberculosis, while among the 45 workers from other locals sent for examination, ten, or 22.2 per cent., were tuberculous. These percentages are, obviously, very high."

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